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A NEGLECTED PHASE OF INSECT CONTROL WORK IN THE PHILIPPINES

Within a brief period of about three months the College of Agriculture has had three significant visits from foreign entomologists. The first of these was by a Japanese entomologist accredited to a Government concern in Formosa; the second, by an American in the employ of the Hawaiian Sugar Planters' Association (at the present writing he still has his headquarters on the College Campus); and the third, by an Italian who had been commissioned by the University of California to do a certain piece of investigation for that institution. The nature of the work of these three entomologists, as has been reported on elsewhere, in the "College and Alumni Notes" of THE PHILIPPINE AGRICULTURIST, is to collect natural enemies of certain destructive insects with the end in view of colonizing them in the various countries in which the institutions that employ them are operating.

The visits of these scientists, which, by the way, were not the first of their kind in this country—for we have had calls of a similar nature from time to time during the past ten or fifteen years—serve to draw attention to the growing importance of the subject of natural enemies as a phase of pest control. This aspect of economic entomology has long passed the stage of purely theoretical interest. It has been found time and again, in other countries, to be thoroughly practical, and in not a few cases, has been made to succeed where all other methods failed. Tangible proofs of remarkable results following its use are extant, as witness for instance the oft-quoted case of the once destructive San José scale in California which was kept down to the point of comparative inoffensiveness through the agency of an imported lady beetle. The control of the gipsy moth in the eastern United States by means of introduced parasites presents another bright page in the annals of parasitic-control work. Another notable instance, which is a very recent one, was the case of the white grubs in the sugar cane fields in Hawaii. At one time these pests became so numerous as practically to discourage the sugar cane planters in that country. This sad plight would probably have continued indefinitely if the entomologists whom the Hawaiian Sugar Planters' Association had sent on a world-wide search for natural enemies had not succeeded in discovering, in the Philippines, a small parasitic wasp, *Scolia manilæ* Ashmead, which is very abundant in that country. Upon introduction in Hawaii the Philippine Scoliæ increased so rapidly in number and developed such an appetite for the white grubs there, that at present the Hawaiian cane fields may be considered as saved in so far as this pest is concerned.

Numerous other noteworthy cases may be cited, and, indeed, advanced agricultural countries are so fully convinced of the value of introduction of natural enemies as a means of permanent control of insect pests that they have made this work a regular institution, with assurance of continued support. Even commercial enterprises, which must reckon on fair returns for every dollar invested, have not hesitated to embark in ventures of this nature.

As to what an intensive, systematic effort in this direction would do for Philippine agriculture has often been the subject of optimistic speculation. Attention has been repeatedly called to this matter by different men, although to our knowledge no concrete action has as yet been taken. Advocates of parasitic-control work have confidently predicted that many of our most vexing problems in economic entomology, such as the case of migratory locusts, will in due course find their final solution in gathering together from as many different countries as possible natural enemies and colonizing them in the Islands. This subject involves extremely complicated biological phenomena, and, to be reasonably sure of effective results, the work must, at least in its incipient stages, be intrusted in the hands of those who by their special training and experience are fully qualified. We can not help but share in the optimism of the most enthusiastic sponsors of parasitism, and we are sure that the investment in the long run will yield large dividends in terms of crops saved. May we not profit by the example set forth by other countries, and at least give this scheme a fair trial?

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THE PROXIMATE CHEMICAL ANALYSIS OF PHILIPPINE FOODS AND FEEDING STUFFS[1]

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With the help of the Experiment Station Chemistry Staff[2]

The Agricultural Chemistry Department is requested frequently by thesis students and staff members of other departments for chemical analysis on a variety of materials used in their respective investigations; and, occasionally, samples are received from business men and farmers. To meet the demand of this ever increasing number of applications, an experiment station chemical analytical laboratory was set up two years ago. The major part of the work has been on the analysis of different feeding mixtures from students working in the Animal Husbandry Department and the biological laboratory of the Chemistry Department.

As the laboratory facilities have been increased, additional work has been carried out on materials coming from other departments. From a scientific, as well as from a practical point of view, the publication of the results of these analyses appears desirable.

Ever since the feeding of animals has been given serious study, methods of comparing and evaluating feeds have been sought, and their proximate chemical composition remains as the standard basis of comparison. While investigations have shown that a feed should be compounded with reference, not only to its chemical composition, but also to its net energy, mineral contents, proteins from different sources, and the essential vitamins or "food hormones," yet the percentage of composition, of moisture, proteins, fats, crude fiber, and carbohydrates, or nitrogen-free-extract, remains as the principal basis of all feeding standards. The man who considers, with the help of the proximate composition of his feeds as revealed by chemical analysis, the uses for which the feeds are most suitable, is able to use them more economically as well as to purchase the constituents he needs more cheaply than the man who ignores the importance of chemical analysis. Consideration of chemical analysis has been equally important in other pursuits, particularly in the manufacturing industries, where it has been of special service in controlling the different processes.

The data presented in the tables given with this paper include all the results of chemical analyses of Philippine materials published in the past, not only from

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[1] Experiment Station contribution No. 296. Compiled from results obtained at the U. P. College of Agriculture Experiment Station Food Laboratory, together with published results from various sources.

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this department but from the other branches of the government doing similar work. It is believed that by putting them together in tabulated form, the usefulness of the data will be greatly increased.

So far as the writer knows, this is the first attempt to publish a compilation of data on results of analysis on the different Philippine food and feeding materials.

No attempt is made in the present paper to discuss the relative values of the results obtained, or to compare these results with the data obtained by other investigators.

The voluminous tables on the analyses of agricultural, biological, and industrial products other than foods and feeding stuffs have not been included in this compilation; they are filed and will be used in similar work which will be undertaken in the future.

SAMPLES EXAMINED

The greater number of samples that have been analyzed came from the Department of Animal Husbandry. These are materials, such as copra meal, cereals, legumes, ducks' eggs, different varieties of grass, milk of different species of animals, and various grades of cheese made at the College and by outside manufacturers. The Department of Agronomy has sent, from time to time, different kinds of cereals, vegetables, fruits, legumes, rices, plant cuttings, fertilizers, and soil amendments. From the Forestry School have been received charcoal produced in their kilns from different species of plants. Besides these samples, the laboratory has been called upon to make minor analyses for one or more of the constituents of other substances coming from different sources.

Some of these samples have come to us in bottles and in tin cans, others, in ground form in bulky containers, while in the case of grasses, cereals, legumes, and rices, the preliminary chopping and the final sampling were done in the laboratory. In all cases, the sampling was carefully performed so as to obtain a representative sample from each lot.

In the latter part of the work, the history and all other valuable information that could be obtained was recorded, but this was not possible in the first stages, since nothing definite about the origin and other points, except the name of the sample and the department under which the investigation was being undertaken, could be ascertained from the applicants. The different samples were carefully ground if necessary, sampled, bottled, and corked. In the order received, each sample was given a number. Whenever a sufficient quantity of the original sample was received, a small amount was always reserved in a container for future reference.

METHODS OF ANALYSIS

In the analysis of the foods and feeding materials and similar products a complete determination of the proximate constituents was made, unless otherwise requested. The methods used for the different analyses were taken from the *Official Methods of Analysis*, compiled by the Association of Official Agricultural Chemists (latest revision). In all other cases, the methods adopted in the standard textbooks on chemical analysis were used. The following references were freely consulted:

Leach's (1912) *Food Inspection and Analysis;* Griffin's (1921) *Technical Methods of Analysis;* and Mahin and Carr's (1923) *Quantitative Agricultural Analyses.*

DEFINITIONS OF TERMS

A brief discussion of some of the most important terms used follows. Definitions of other terms may be found in analytical textbooks dealing with the particular constituents in question.

Edible portion. The portion of the sample which is considered edible, as in the case of fruits, is that obtained after removing the peelings and seeds, or that part commonly eaten as food. As the percentage of edible portion varies a great deal with different materials, this data should prove valuable. Where it was possible, data on this were obtained in all cases.

Moisture. In agricultural analysis, it is found desirable to determine the percentage of volatile substances present in any given sample which are driven off when it is heated at ordinary pressure to the temperature of boiling water (100° C.), or higher, that is, between 105–110° C. In all of the work here reported, the Freas-constant-temperature electric oven, adjusted to a temperature of 105° C. $\pm$ 0.1° C. was used. The loss obtained by this treatment is reported as *moisture.* Even the apparently very dry materials lose some weight when kept to this temperature for several hours.

Crude fats, or ether extract. Crude fats, or ether extract, is a term which includes all substances as fats and oil, waxes, resins, alkaloids, chlorophyll, etc., which are soluble in ether. Hence it represents more than the actual percentage of the fat or oil content of the sample.

The most common solvent used for these analyses is ethyl ether, although light petroleum ether, because of its poor solvent action on vegetable constituents other than fats, gives results which more nearly approach the true value, while the ethyl, as stated, dissolves other substances. However, for purposes of comparison, the ether was used since it has been most generally employed in analytical operations.

Crude protein. Crude protein is a term used to designate the number obtained by multiplying by 6.25 the total nitrogen as obtained by one of the Kjeldahl methods. The value of a nitrogenous feed is graded by its protein content, and it is considered an expensive constituent of a feeding stuff. Although the figures for crude protein obtained with the use of an empirical factor can only be rough approximations to the amount of proteins actually present, in most cases they approach very closely the true values. The fact that this basis of calculation has been most generally used is in itself a good reason for continuing the practice until the majority agree to adopt a factor which gives better average results. Food values are comparative and results must be expressed in figures which can be readily compared with those obtained at any other time or by other investigators.

Crude fiber. Crude fiber is the residue obtained by treating a sample alternately with boiling dilute acid and alkali. The complex bodies which are obtained by this treatment are evidently not definite compounds, but are composed of mixtures of compounds generally known as "celluloses". They have comparatively little value in food. Materials containing a high percentage of crude fiber are usually of low digestibility.

Ash. Ash is the incombustible residue which remains after a sample is charred. It includes all the mineral constituents that may be found in the material, usually in the form of oxides. The results may be affected greatly by excessive heating. Ash is burned in a muffle at a very faint red heat until the residue is white or gray and free from carbon particles. At higher temperatures some of the constituents may be volatilized and thus escape detection.

Nitrogen free extract, or carbohydrates. Most of the recorded analyses of foods and feeding-stuffs express the carbohydrates under one general name without attempting to give separate figures for the different kinds present. The figure expressing "carbohydrates" is usually obtained by subtracting the sum of the percentages of moisture, ash, fats, proteins, and crude fiber from 100, and is termed nitrogen-free-extract, or carbohydrates.

Fuel value. The calorific value, or heat of combustion of any substance, that is, the amount of energy liberated by the burning of a given quantity of combustible material, is best determined by means of a bomb calorimeter. In its absence, the approximate value of the heat of combustion may be calculated from the composition of the substance.

According to Rubner, the fuel values of the different food constituents are:

Carbohydrates	4.1	calories per gram.
Fats	9.3	" " "
Protein	4.1	" " "

Therefore, to calculate the calorific value of a feed, it is necessary to multiply the percentages of the different constituents by the corresponding number of calories per gram.

As an illustration, if it is desired to determine the calorific value per kilogram of a substance which on analysis gave the following percentage composition:

Fats	0.88 per cent
Proteins	18.30 per cent
Carbohydrates	62.49 per cent

each percentage is multiplied by the corresponding factor as shown below:

0.88×9.3 =	8.184	calories	per	100	grams
18.30×4.1 =	75.03	"	"	"	"
62.49×4.1 =	265.20	"	"	"	"
Total...	339.423	"	"	"	"

339.423×10 = 3,394.23 calories per kilogram.

The calorific value of the feed in question, therefore, is 3,394.23 calories per kilogram.

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TABLE I

Analyses of cacao, coffee, and their products (Brill,

SAMPLE	FAT	THEOBROMINE	N × 6.25	GLUCOSE	SUCROSE	STARCH	ASTRINGENT MATTER	CELLULOSE	EXTRAIVE MATT
	per cent	*per cent*	*per cent*	*per cent*	*per cent*	*per cent*	*per cent*	*per cent*	*per c*
Ariba	46.00	0.91	10.77	0.44	6.76	1.67		14.95	9.5
Bahia	44.77	1.14	7.97	1.13	0.54	8.01		14.67	9.5
Cuaracao	39.42	1.20	11.33	2.94	1.67	1.08		17.50	13.6
Criollo variety—U	48.13	0.71	12.13	0.73	2.08	3.62	4.83	14.83	16.2
Criollo variety—2	52.27	1.27	12.81	0.63	0.85	5.14	4.31	14.13	12.8
Criollo variety—4	52.06	1.11	12.25	0.46	0.11	5.52	4.27	14.69	13.1
Criollo variety—5	51.00	0.90	12.06	0.45	0.00	5.41	4.04	15.71	11.8
Criollo variety—6	55.34	1.10	11.44	0.10	0.00	5.85	4.04	15.43	12.2
Criollo variety—7	53.13	0.84	12.19	0.36	0.00	5.91	3.65	15.36	11.2
Criollo variety—8-y	59.69	0.84	11.38	0.27	0.00	4.58	2.88	11.12	11.0
Criollo variety—6-TD	53.62	0.75	13.06	0.49	0.27	4.81	3.13	11.14	12.7
Criollo variety—6-y-s	50.79	0.70	12.69	0.15	0.00	4.62	3.55	13.48	11.3
Criollo variety—TD-S	50.11	0.80	13.43	0.15	0.45	4.26	4.11	17.91	12.8
Criollo variety—7-C	50.08	1.06	12.94	0.39	0.56	3.96	2.96	14.26	11.5
Criollo variety—7-T	46.12	1.10	13.19	0.77	0.22	5.17	3.27	14.86	13.8
Criollo variety—7-A	45.64	1.20	12.75	0.92	0.10	5.36	3.59	14.63	13.8
Forastero variety—U	43.67	0.70	12.88	0.91	1.71	2.33	6.20	14.78	17.1
Forastero variety—2	49.92	0.80	13.50	0.13	1.83	5.00	5.31	14.61	15.0
Forastero variety—4	49.93	1.05	13.00	0.02	1.38	5.18	4.83	13.94	15.0
Forastero variety—5	51.09	0.85	13.13	0.25	0.22	5.42	4.31	14.76	13.0
Forastero variety—6	52.21	0.88	13.91	0.21	0.45	5.49	4.20	14.21	14.1
Forastero variety—7	53.55	1.02	13.00	0.10	0.27	5.92	3.69	14.75	12.1
Forastero variety—6-y	50.30	0.75	13.38	0.24	0.00	4.52	3.07	10.65	11.0
Forastero variety—6-TD	55.99	1.00	13.88	0.05	0.40	5.07	3.35	10.71	8.8
Forastero variety—7-C	46.29	1.08	13.50	0.33	0.64	4.15	5.09	14.39	14.8
Forastero variety—7-T	48.36	0.80	13.75	0.44	0.30	4.18	3.55	14.88	12.0
Forastero variety—7-A	41.67	0.85	13.69	0.87	0.61	4.56	3.55	14.44	12.8
Granada	46.57	0.79	10.31	1.91	0.58	6.61		14.24	10.2
Java	47.64	1.22	9.76	1.30	0.54	5.45		14.60	9.3
Machalle	49.75	0.81	13.45	1.70	0.49	1.43		12.00	9.8
Maracaybo	44.77	1.09	12.25	1.15	1.44	1.79		18.36	7.2
Surinam	43.44	0.98	10.82	1.33	0.37	3.81		17.07	14.2
Tabasco	51.75	1.17	7.98	0.95	2.76	3.57		12.77	9.8
Trinidad	46.61	0.90	12.70	1.47	0.34	5.32		13.90	8.8
Average Philippine criollo	51.99	0.97	12.15	0.46	0.51	5.24		14.69	12.9
Average Philippine Forastero	50.06	0.88	13.24	0.27	0.98	4.89		14.51	14.4
Chocolate from native factories	48.00				None	10.26			
Chocolate from native factories	29.90				38.99	6.20			
Chocolate from native factories	22.85				53.70				
Chocolate from native factories	22.40				60.20				
Chocolate from native factories	21.60				59.70				
Chocolate from native factories	23.42				61.40				
Chocolate from native factories	22.85				71.60				
Chocolate from native factories	20.00				59.38				
Chocolate from native factories	24.27		10.40		59.23				
Chocolate from native factories	18.34		7.64		59.24				
Sample used by U. S. Army	36.75		6.50		22.00				
Sample used by U. S. Army	32.44		5.25		25.66				
Coffee, raw	11.80		14.50		7.62				
Coffee, roasted	13.85		16.25		1.31				

1916, 1917)

CT-ER	ASH	INSOLUBLE ASH	ALKALINITY OF ASH FROM 1 gr. cc. N/10	MOISTURE	PERCENTAGE OF PEANUT OIL IN FAT	ASH SOLUBLE IN WATER	CRUDE FIBER	LIGNIN
nt	*per cent*	*per cent*		*per cent*		*per cent*	*per cent*	*per cent*
6	3.96							4.88
6	3.83							8.36
1	4.66							3.51
5	5.05	2.39	4.06					
8	5.57	2.16	3.39					
3	5.10	2.43	3.35					
8	4.63	2.30	3.26					
5	4.92	2.45	3.13					
5	4.70	1.80	2.72					
8	2.95	1.63	2.77					
5	2.93	1.46	2.35					
8	4.10	2.55	3.51					
3	4.60	2.60	3.30					
8	5.12	2.12	2.70					
0	5.22	2.58	2.52					
8	4.90	2.32	3.82					
.3	4.93	2.42	4.17					
0	4.77	2.33	3.67					
0	4.98	2.42	3.74					
7	4.55	2.23	3.02					
.3	4.63	2.20	2.82					
.3	4.77	2.57	2.99					
7	2.55	1.16	2.16					
5	3.25	1.38	2.03					
5	5.27	2.12	2.51					
3	5.00	2.24	2.91					
0	4.98	2.22	2.78					
9	2.86							5.85
9	3.49							6.43
6	4.40							6.30
0	4.38							7.59
1	3.21							4.11
1	3.11							6.54
8	3.84							6.03
6	4.99							
1	4.78							
	3.71			3.77	None	1.70	3.40	
	2.34			2.89	None	1.23	1.60	
				1.83	25.00			
				1.10	20.00			
				1.96	25.00			
				1.88	46.00			
				1.39	50.00			
				1.10	9.00			
	2.50			2.40	12.80			
	1.84			3.38	13.00			
	3.00			2.05	None		1.85	
	2.63			0.70	None		1.20	
	3.02			10.73			24.01	
	4.65			2.33			18.07	

TABLE 2

Analyses of Philippine cereals and legumes and some of their by-products (Gibbs, 1912; Agcaoili, 1916; Brill, 1916; Wells, 1922; Groff, 1919)

EXP. STA. NO.	NAME	MOISTURE	ETHER EXTRACT	ASH	PROTEIN N X 6.25	CRUDE FIBER	CARBOHYDRATES	P_2O_5	FOOD VALUE PER 100 GR. SAMPLE	HULLED RICE	HULL
		per cent	*per cent*	*per cent*	*per cent*	*per cent*	*per cent*	*per cent*	*calories*	*per cent*	*per cent*
308	Adlay, C. A. 1729 (white) air dry	13.97	0.13	0.50	8.68	0.24	76.48		350.37		
309	Adlay, C. A. 17293 (black) air dry	13.37	0.28	0.32	9.21	0.20	76.62		354.51		
307	Adlay, Mt. Province, air dry	11.37	0.53	0.45	9.79	0.19	77.67		363.52		
	Baked cakes, toqua	73.00	10.78	1.20	13.88						
	Baked cakes, toqua	72.10	10.99	1.27	17.56						
295	Beans, black patani, air dry	13.82	4.43	3.66	7.87	4.03	66.19		344.85		
	Beans, phaseolus lunatus, pink variety	15.85	1.30	3.65	14.84		64.36				
59	Bean, soy bean seeds (white), air dry	9.87	19.47	5.19	35.92	17.49	12.06		377.79		
299	Beans, white sword, air dry	14.49	2.46	3.36	20.48	2.42	56.79		339.69		
	Calamismis, large variety (new dried beans)	9.55	11.60	6.55	29.75		42.73				
	Calamismis, small variety (new dried beans)	9.80	18.50	4.65	28.28		38.77				
	Centrosema plumeri (Tunp Benth)	19.50	0.70	4.42	14.88		60.50				
64	Corn seeds (yellow), air dry	13.88	4.47	2.61	8.90	2.86	67.28		353.91		
304	Corn seeds, Calawang Yellow, air dry	13.68	2.52	1.72	10.38	2.73	68.97		348.77		
318	Corn, Mosby, air dry	12.57	5.68	1.70	6.79	2.60	70.66		370.37		
305	Corn seeds, Werma, air dry	11.95	1.45	2.44	9.39	2.59	72.18		347.92		
51	Cowpea seeds, air dry	16.87	1.94	3.99	16.24	4.01	56.77		318.12		
	Geerligs cheese, tao-hu	76.15	7.09	2.21	13.15						
	Ipil-ipil seeds (mature) air dry	14.80	10.91	0.51	28.34	5.72	39.72		380.51		
	Ipil-ipil (raw)	14.80	8.68	4.20	40.13	22.29	9.78				
	Ipil-ipil (roasted)	8.13	6.95	4.37	32.56	22.18	16.11				
	Koningtofu	84.81	5.25	1.08	7.41						
171	Mungo pods, fresh	82.01	1.19	1.07	2.96	3.62	9.14		60.68		
313	Mungo seeds, air dry	13.53	1.20	3.60	17.85	1.52	62.30		339.78		
61	Paayap pods, fresh	89.59	0.37	0.21	3.06	1.64	5.13		37.02		
170	Paayap pods, fresh	84.55	0.42	0.87	2.48	3.48	8.40		48.51		
	Pigeon pea (c. cajan L. Merr)	12.20	1.75	4.65	24.38		57.02				
296	Ragi seeds, air dry	13.59	3.18	3.75	7.03	5.36	67.09		333.47		
	Soja bean cheese (bloch)	83.85	4.33	0.57	11.25						
	Soja bean pressed cakes	88.75	0.04	0.36	1.55						
352	Bigas patay (dead rice)	13.63	0.60	0.91	9.34	0.38		0.46			
493	Apostol (L) 180[a]	11.39	1.10	1.50	8.35	0.92	76.74		359.099	74.18	25.82
481	Balayong (L) 159	12.25	1.09	1.19	7.37	0.77	77.33		357.407	71.98	28.02
472	Binicol (U) 147[b]	12.25	2.88	1.36	7.73	0.73	75.05		366.182	69.20	30.80
473	Bolilising (L) 156	14.39	1.85	1.53	6.63	0.86	74.74		350.822	73.24	26.76
460	Bulandi (U) 154	14.16	1.86	1.77	7.22	0.75	74.24		351.284	78.81	21.19
483	Cabarong	11.95	1.20	1.48	6.43	0.90	78.04		357.487	69.37	30.63
491	Calibo (U) 112	11.36	2.02	1.36	7.87	0.68	76.71		365.564	71.55	28.45
486	Cochon (L) 160	13.46	1.04	1.26	7.76	0.75	75.73		348.250		
487	Cruz (L) 148	12.51	1.70	2.44	8.34	0.73	74.24		354.388	61.99	38.01
484	Daluson (L) 154	13.30	1.91	1.57	8.86	0.98	73.38		354.947	68.21	31.79
495	Dinalaga (L) 127	11.90	0.92	1.22	8.29	0.66	77.01		358.286	74.01	25.99
463	Guinaracia (L) 189	13.39	1.97	1.33	6.26	0.85	76.20		356.407	76.39	23.61
485	Humbas (L)	12.58	0.65	1.26	7.92	0.92	76.67		352.864	78.03	21.97
467	Inalunayan	13.67	1.08	1.15	6.40	0.69	77.01		352.025	71.52	28.48
482	Inasinag (L) 90	12.67	0.80	1.61	10.66	0.95	73.31		351.717	69.52	30.48
462	Ininten (U) 119	12.33	1.73	1.30	6.56	0.81	77.27		359.792	71.05	28.95
477	Iroy (L) 156	13.55	1.37	1.40	8.02	0.71	74.95		352.918	67.08	32.92
471	Kainte (L) 149	13.30	1.47	1.19	7.78	0.55	75.71		355.980		
465	Kinafe (U) 124	13.04	0.23	1.37	7.48	0.70	77.18		349.245	70.91	29.09
461	Kinandang linusac (U) 137	12.21	1.92	1.58	6.01	0.63	77.65		360.862	77.99	22.01
468	Kinandang locoloco (U) 136	14.23	1.60	1.48	7.83	0.80	74.06		350.629	76.11	23.89
480	Kinandang pula (U) 120	14.47	3.29	1.42	8.66	0.92	71.24		358.187	76.29	23.71
489	Kinastila (U) 141	12.46	1.88	1.30	7.71	0.76	75.89		360.244	65.29	34.71
488	Lumbang (L) 146	12.90	2.07	1.38	7.72	0.94	74.99		358.362		
478	Macabiag (L) 154	13.63	2.50	1.49	9.07	0.77	72.54		357.851	71.53	28.47
469	Macan (L) 128	13.19	0.64	1.29	7.59	0.54	76.75		351.746	72.55	27.45
474	Macan gumpol (U) 203	13.70	1.47	1.40	9.15	0.88	73.40		352.126	75.51	24.49
496	Marintumatong orong (L) 160	11.73	1.10	1.25	9.28	0.71	75.93		359.591		
464	Minalit (L) 178	12.81	3.27	1.39	6.67	0.77	74.78		364.523	67.20	32.80
492	Murmuray (L) 192	13.13	0.44	1.28	7.56	0.83	76.76		349.804	86.84	13.16
494	Piling-baybay (L) 90	11.16	0.66	1.60	9.01	0.88	76.69		357.508	72.50	27.50
466	Pinursigue (U) 119	12.97	0.81	1.44	7.52	0.61	76.65		352.630	72.33	27.67
490	Roxas (L) 129	12.84	0.44	1.24	6.51	0.89	78.08		350.911	71.52	28.48
476	Seda (L) 179	11.69	3.52	1.53	10.03	0.89	72.34		370.453	72.98	27.02
459	Sinacuban (L) 138	13.85	1.75	1.43	6.84	0.77	75.36		353.295	77.87	22.13
475	Sinantol (L) 163	13.23	2.56	1.25	7.95	0.43	74.58		362.181	76.80	23.20
479	Sinongsong (U) 106	12.30	3.94	1.71	7.56	0.88	73.61		369.439	70.11	29.89
470	Tiniang (U) 99	13.31	0.66	1.19	8.12	0.82	75.90		353.131	77.13	22.87
	Apostol (1001)	14.53	1.56	1.29	8.01	0.88	73.73	0.766	349.01		
	Bad-as (27)	14.90	3.43	1.78	7.00	1.09	72.89	1.030	359.39		
	Conner (1002)	11.90	2.03	1.18	8.14	0.99	75.76	0.767	362.10		
	Cruz (1003)	12.10	0.93	1.26	8.09	1.21	76.41	0.695	354.22		

Dinagat "A" I (semi-upland) (362)	12.50	2.29	1.15	7.58	1.13	75.35	0.700	361.22		
Inachupal (429)	14.15	3.70	2.21	8.31	1.00	71.63	0.980	362.16		
Inantipolo II (956)	12.88	1.01	0.79	7.83	1.03	76.46	0.501	354.13		
Inasinang (647)	12.03	0.51	1.13	8.10	1.00	77.23	0.628	354.24		
Jinaloan (469)	14.60	2.46	1.20	8.54	1.18	72.02	0.706	357.48		
Jinipon (470)	14.11	2.71	1.19	8.31	1.01	72.67	0.693	355.34		
Kinanda puti (upland) (952)	13.43	1.87	1.19	8.31	1.01	74.19	0.690	355.24		
Kinarabao I (486)	9.96	2.53	1.69	7.33	1.35	77.14	0.837	370.08		
Macan (527)	12.53	0.83	1.49	8.23	1.02	75.90	0.773	352.25		
Malon-ay (629)	9.62	1.24	1.26	7.88	1.76	80.00	0.710	371.12		
Manabaco (578)	13.15	4.14	2.03	8.66	1.08	70.94	0.892	364.22		
Manabunac (579)	10.65	3.73	1.55	7.66	1.31	75.10	0.790	374.40		
Manticanon (598)	11.05	2.28	1.31	7.48	1.32	77.88	0.810	370.98		
Piniling Daniel (692)	12.02	1.41	1.30	7.96	0.95	76.36	0.729	358.05		
Quinanay (739)	11.28	1.36	2.88	8.49	1.20	74.79	0.952	304.29		
Quinatia I (756)	10.72	1.07	2.14	7.57	2.26	78.50	0.770	362.52		
Roxas No. 1 (1004)	12.93	1.70	1.33	7.88	0.93	75.23	0.714	356.53		
Tarbayanon II (860)	10.73	1.68	0.77	8.09	1.19	76.56	0.552	366.92		
Virgen (905)	10.48	2.23	1.23	7.00	1.25	77.81	0.652	368.63		

[a] (L) lowland rice. [b] (U) upland rice.

NOTE:—Figures after each variety of rice indicate number of days from planting to maturity.

TABLE 3

Analysis of Philippine cheese (fresh)

EXP. STA. NO.	SAMPLE	MOISTURE	ASH	BUTTER FAT	REDUCING SUGARS	CASEIN BY DIFFERENCE	NaCl	ACIDITY EXPRESSED IN CC. 0.1N NaOH PER 100 GR. SAMPLE	TOTAL WITH CASEIN BY DIFFERENCE
		per cent	*per cent*	*per cent*	*per cent*	*per cent*	*per cent*		*per cent*
335	Cebu cheese	49.27	4.24	24.47	1.72	20.30	2.36	47.66	100
342	Cebu cheese	45.42	2.59	33.23	1.52	17.24	0.96	18.97	100
329	Cottage cheese made at College	67.61	1.84	17.67	1.68	11.20		72.50	100
336	Cottage cheese made at College	49.12	2.77	16.60	1.67	29.84	1.13	69.93	100
324	Cottage cheese made at College	71.77	3.04	12.83	2.52	9.84	2.10	82.31	100
264	Made at College, San Pedro Tunasan Method	53.90	2.82	20.82			1.83		
265	Made at College, San Pedro Tunasan Method	58.82	4.37	24.52			2.86		
276	Made at College, San Pedro Tunasan Method	48.38	2.99	33.39			2.07		
293	Made at College, San Pedro Tunasan Method	57.44	3.65	27.04	1.49	10.38	2.02	20.70	100
312	Made at College, San Pedro Tunasan Method	51.25	3.50	24.86	1.21	19.18	1.33	61.40	100
246	Made at College, Sta. Cruz Method	40.63	3.72	39.76					
247	Made at Sta. Cruz, Native Method	51.83	4.52	29.10			2.24		
253	Made at College, Sta. Cruz Method	48.95	4.29	27.57			2.57		
254	Made at College, Sta. Cruz Method	54.96	3.84	28.38			2.11		
287	Made at College, Sta Cruz Method	54.65	4.81	28.88					
292	Made at College, Sta. Cruz Method	58.49	5.30	26.92	1.87	7.42	3.52	9.40	100
319	Made at College, Sta. Cruz Method	54.89	5.04	19.81	1.92	18.34	1.88	10.66	100
320	Made at College, Sta. Cruz Method	59.60	3.45	21.27	2.30	13.38	1.69	13.83	100
327	Made at College, Sta. Cruz Method	61.80	4.19	17.08	1.31	15.62	2.27	17.06	100
345	Made at College, Sta. Cruz Method	58.43	4.52	25.55	2.38	9.12	2.94	14.44	100
326	Made at Meycawayan	69.48	3.76	14.01	1.71	11.04	2.54	38.38	100
328	Made at Meycawayan	63.73	3.14	23.39	1.69	8.05	2.28	41.79	100
332	Made at Meycawayan	51.85	7.77	24.09	0.004	16.286	5.96	21.61	100
340	Made at San Pedro Tunasan	60.10	6.54	20.41	4.50	8.45	3.99	16.60	100

TABLE 4

Analyses of eggs (Gibbs and Agcaoili, 1912)

SAMPLE	AVERAGE SIZE OF EGGS		EDIBLE PORTION	MOISTURE	ASH	FATS	PROTEIN (N×6.25)	TOTAL	NITROGEN FREE EXTRACT
	Length	Width							
	cm.	*cm.*	*per cent*	*per cent*	*per cent*	*per cent*	*per cent*	*per cent*	*per cent*
Duck's egg, composition of the whole			86.70	70.81	1.08	15.04	12.77		0.30
Duck's egg albumen, composition of the whole				87.00	0.80	0.03	11.10		1.07
Duck's egg yolk, composition of the whole				45.80	1.20	35.20	16.00		
Duck's egg, fresh 3 day-old unincubated (7)	5.79	4.49	87.05	72.29	0.95	11.72			
D. E. fresh after 7 days of incubation (15)	5.76	4.51	86.44	71.33	1.08	13.61			
D. E. fresh after 14 days of incubation (15)	5.80	4.51	85.89	71.14	1.05	13.76	11.50		
D. E. fresh after 21 days of incubation (15)	5.82	4.49	84.31	70.96	1.28	11.41	13.64		
D. E. fresh after 28 days of incubation (15)	5.87	4.50	84.32	73.91	1.44	8.95	12.83		
D. E. boiled 3 day-old incubated (15)	5.86	4.50	88.92	71.05	0.95	12.74	12.85		
D. E. boiled after 7 days of incubation (15)	5.87	4.49	86.87	71.73	1.06	12.29	13.41		
D. E. boiled after 14 days of incubation (15)	5.87	4.49	86.61	70.21	1.14	12.65	14.11		
D. E. boiled after 21 days of incubation (15)	5.85	4.50	85.00	72.17	1.17	12.87	14.33		
D. E. boiled after 28 days of incubation (15)	5.85	4.51	83.83	70.02	1.75	10.53	15.75		
D. E. av., or 3 day-old not incubated (15)	5.86	4.49	87.44	71.31	1.06	11.44	11.98		
D. E. hard boiled			85.11	71.35	1.03	14.12	13.59	100.1	
D. E. fresh egg			85.78	72.88	0.98	13.92	13.04	100.82	
D. E. cooked balut			85.71	70.40	0.97	12.84	15.63	99.84	
D. E. uncooked balut			90.38	71.76	0.99	14.23	12.69	99.67	
H. E. composition of the whole egg			88.60	73.67	1.07	12.02	12.57		0.67
H. E. composition of the whole egg albumen				85.61	0.67	0.25	12.77		0.70
H. E. composition of the whole egg yolk				50.93	1.02	31.70	16.05		0.29

NOTE:—D. E. stands for duck's egg and H. E. stands for hen's egg. Numbers in parentheses indicate number of eggs analyzed.

TABLE 5

Analyses of fish, fish products, and other food materials (Gibbs and Agcaoili, 1912[a], 1912[b], 1912[c]; Wells, 1916)

EXP. STA. NO.	SAMPLE	EDIBLE PORTION	SOLIDS	WATER	PROTEIN N×6.25	FAT	ASH	SODIUM CHLORIDE	ALCOHOL	CARBOHYDRATES	UNDETERMINED	CALORIES PER 100 GRAMS	CRUDE FIBER	STARCH
		per cent	*per cent*	*per cent*	*per cent*	*per cent*	*per cent*	*per cent*	*per cent*	*per cent*	*per cent*	*per cent*	*per cent*	*per cent*
	Alamang bagoong		32.13	67.87	15.63	2.22	14.30	11.77						
	Alamang, pressed		30.92	69.08	10.44	1.15	15.20	14.42						
	Bagoong		42.30	57.70	13.44	1.25	24.98	22.04						
	Bagoong, liquid		24.30	75.70	7.50	0.68	15.34	12.36	4.02					
	Bagoong, solid		31.62	68.38	10.14	3.53	15.60	12.40						
	Bakuku and sapsap (16)		68.57		35.00	5.74	26.76	12.08						
	Bihon		83.82	16.18	9.34	1.84	0.22			72.42				
	Crude molasses[a]		70.46	29.54	0.53			1.29			1.10			
	Dilis (57)		74.71		35.90	6.52	29.42	1.24						
	Espada (3)		62.04		33.69	4.28	23.53	15.21						
	Gulaman (Philippine)			16.00	4.20	1.20	4.00							35.39
	Gulaman (Japanese)			19.60	4.23	1.08	2.90							29.65
	He-ko		35.63	64.37	12.38	0.90	20.70	18.71						
	Hoppers (insect) loctun[b]			75.97	10.33	0.69	1.88			7.84		80.91	3.29	
	Jelly (gulaman dagat)			99.37	0.10	0.10	0.04			0.39				None
	Locust (genus acrydeum)	81	40.39	59.61	24.13	7.89	1.79				6.58			
	Macaroni		89.70	10.30	13.40	0.90	1.30			74.10				
	Mique		83.26	16.74	7.88	1.63	2.47			71.28				
	Misua		83.44	16.56	11.20	2.07	4.73			65.44				
400	Nata from sugar cane juice			98.56	—	—	0.02			0.47		1.93	0.95	
425	Nata from sugar cane juice			98.77	None	None	0.02			—			1.25	
429	Nata from pineapple			90.09	0.67	0.37	0.60			7.41		33.13	1.23	
	Patis		32.15	67.85	4.51	3.27	23.40	22.72						
	Rice		86.89	13.11	7.85	0.88	1.01			77.15				
43	Seaweed B, Biguey, Cagayan			15.73	5.00	1.17	6.82			64.58		296.16	6.70	
44	Seaweed A, Magsingal, Ilocos Sur			9.33	8.62	1.21	18.66			53.80		267.18	8.38	
179	Seaweed amagan			33.44	5.01	1.29	24.89			30.24		156.52	5.13	
42	Shrimp, dried			14.55	55.61	2.61	19.73			3.26		265.64	4.24	
	Tahuri or tahuli, solid			55.76	14.56	7.12		12.70						
	Tahuri or tahuli, liquid			57.86	9.56	2.09		16.38						
	Tinapa (7)		43.98		28.00	4.87	10.18	3.92						
	Toyo[d]		34.74	65.26	0.75		27.47	24.86			0.68			
	Toyo made with sugar[e]		41.69	58.31	4.93		24.74	20.12	Trace		2.52			
	Tuyu (6)		55.10		30.63	7.57	16.24	12.40						
	Vermicelli		89.00	11.00	10.90	2.00	4.10			72.00				
	Wheat		86.35	13.65	12.35	1.75	1.81			70.44				

[a] Sucrose, 54.14 per cent; reducing sugars, +12.64 per cent.

[b] Ash { P_2O_5 ..... 9.37 per cent. K_2O ..... 13.14 per cent. CaO ..... 4.55 per cent.

[c] Acidity as acetic, 1.68 per cent.

[d] Sucrose, 3.25 per cent; reducing sugars, +2.59 per cent.

[e] Reducing sugars, +9.50 per cent.

Analyses of fruits (Pratt and Rosario, 19

EXP. STA. NO.	NAME	AVERAGE WT. OF FRUIT	EDIBLE PORTION	MOISTURE	TOT SOL
		gram	*per cent*	*per cent*	*per*
	Ates, Anona squamosa L.	240	52.00		25.
256	Ates (fresh ripe fruits)		58.23	76.18	
248	Avocado C. A. 5680, fresh		67.70	85.39	
251	Avocado C. A. 5680 (fresh fruit)		57.90	87.47	
	Balimbi, Averrhoa caramola L.	33			9.
	Balimbing, fresh ripe fruits			93.91	
	Banana butuhan, butuan, Musa errans var. botoan Teodoro	104.4	58.70	83.08	
	Banana bungulan		73.87	70.00	
	Banana bungulan, Musa sapientum var. suaveolens (Blanco) T.	135	68.20	71.17	
	Banana gloria ternate, Musa sapientum Var. Ternatensis (Blanco) Teodoro	95.8	61.10	66.56	
	Banana inarnibal, Musa sapientum var. inarnival Teodoro	34.9	74.30	72.87	
	Banana lakatan, Musa sapientum var. lacatan (Blanco) Teodoro	72.4	76.40	70.96	
	Banana lakatan		65.49	70.52	
	Banana latundan		78.87	68.12	
	Banana latundan, Musa sapientum var. cinerea (Blanco) Teodoro	62.7	74.20	70.19	
69	Banana (latundan) (fresh ripe fruits)			72.14	
	Banana matavia, batavia. Musa paradisiaca var. maxima (Blanco)	181.2	54.70	69.97	
	Banana morado, Musa sapientum var. violacea (Blanco) Teodoro	71.9	62.00	73.35	
	Banana morado		66.67	71.77	
	Banana principe, Musa sapientum var. principe. Quisumbing	99.0	57.30	73.69	
	Banana saba, Musa sapientum var. Compressa. (Blanco) Teodoro	50.7	61.00	69.16	
	Banana sabang Iloco, Musa sapientum var. grandis. Teodoro	261	59.20	70.59	
	Banana saba		64.65	75.64	
	Banana ternate		63.46	65.29	
	Tundoc, tondo, Musa paradisiaca var. magna (Blanco) Teodoro	446.5	84.00	68.66	
	Bignay. Antidesma bunius Spreng	0.3	80.00		5.
367	Camachile		52.53	78.28	
	Camias, Averrhoa bilimbi L.	16			5.
	Casoy, Anacardium occidentale L.	88	90.00		14.
	Catmon, Dillena philippinensis Rolfe	62	38.00		8.
	Chico, Archras sapota L.	50	85.00		27.
	Chico mamey, Lucuma mammosa Gaertn.	500	70.00		31.
	Cirihuelas, Spondias purpurea L.	20	50.00		13.
	Condol, Benicasa hispida Cogn	900	90.00		5.
	Datiles, Muntingia calabura L.	1.5	80.00		24.
	Duhat, Eugenia jambolana Lam	4	75.00		19.
	Durian (b), Durio zebethimus L	2250	30.00		44.
	Guayabano, Anona muricata L.	650	69.00		22.
	Guava, Psidium guojava L.	45	83.00		24.
250	Guava (native fresh ripe fruits)			81.65	
	Iba, Cicca disticha L.	1.5			11.
	Jack, Artocarpus integrifolia L.	8000	25.00		34.
	Lanzone, Lansium domesticum Jack	20	80.00		19.
290	Lanzones (fresh ripe fruit)		59.13	86.70	
297	Lanzones (Sta. Cruz fresh ripe fruit)		75.16	85.63	
	Limoncito, Triphasia trifoliata DC.	0.8	80.00		19.
	Mabolo, Diospyrus discolar wild	300	55.00		23.
261	Mabolo (fresh ripe fruits)		71.13	82.08	
	Macopa, Eugenia javanica L.	30	90.00		8.
	Mango carabao, Mangifera indica L.	240	73.00		17.
	Mango carabao (green), Mangifera indica L.	175	70.00		13.
	Mango pico, Mangifera indica L.	230	73.00		23.
	Mango pahutan, Mangifera indica L.	85	60.00		25.
249	Mango (fresh ripe fruit)		73.72	82.08	
	Mangosteen, Garcinia mangostana L.	100	31.00		19.
	Melon, Cucumis melo L.	770	75.00		5.
	Melon español, Cucumis melo L.	700	77.00		4.
	Papaya, female, Carica papaya L.	1350	47.00		10.
	Papaya, hermaphrodite, Carica papaya L.	900	63.00		10.
215	Papaya (long fresh ripe fruits)		64.02	87.72	
	Papaya (long fresh ripe fruits)		70.30	88.81	
	Pineapple, Ananas sativus lindi	800	50.00		13.
	Pomelo, Citrus decumana Murr	930	61.00		12.
	Santol, Sandoricum Koetjape (Brum) Merr	85	70.00		20.
358	Sapote		81.42	84.55	
65	Tahiti chestnuts (fresh)		49.73	57.94	
	Tamarind ripe pulp, Tamarindus indica L		50.00		82.
	Tamarind, green, Tamarindus indica L.	15	100.00		85.
	Water melon, Citrullus vulgaris Schrad	2250	51.00		8.

13; Salvador, 1922; Dacanay, 1914)

AL IDS	PROTEIN	CRUDE FATS	CRUDE FIBER	ASH		ACIDITY				CARBOHYDRATES	SUGARS		CALORIFIC VALUE PER 100 GRAMS.
				Total ash	Alkalinity as K_2CO_3	Acidity as H_2SO_4	Acidity as citric	Acidity as malic	Acidity as tartaric		Reducing	Sucrose	
cent	*per cent*	*per cent*	*per cent*	*per cent*	*per cent*					*per cent*	*per cent*	*per cent*	
00	1.12			0.97	0.85	0.15		0.21			15.77	0.22	
	1.67	1.10	1.16	0.73						19.16			95.63
	3.05	7.13	3.75	0.61						0.07			79.10
	1.44	4.55	2.37	0.68						3.49			62.53
40	0.84			0.51	0.33	0.24					2.64	0.00	
	0.24	0.74	0.61	0.42						4.08			24.59
	1.01	0.40	0.50	1.08		0.22				3.03	10.75	0.15	67.0
	0.69		1.58							5.88	9.19		
	1.33	0.74	0.44	0.82		0.28				0.72	16.89	7.89	118.7
	1.07	0.69	0.31	0.93		0.34				3.41	25.00	2.03	136.9
	1.68	0.66	0.52	0.93		0.33				1.93	6.41	15.00	110.8
	1.61	0.67	0.38	1.04		0.31				1.55	7.46	16.33	118.3
	1.21		0.90							2.90	13.19		
	1.27		0.84							3.60	15.90		
	1.59	0.63	0.53	0.97		0.44				2.43	22.72	0.94	121.5
	0.97	0.48	0.51	0.84						25.06			111.19
	1.03	0.59	0.32	0.92		0.54				5.49	18.52	3.16	122.4
	1.47	0.58	0.88	0.88		0.29				1.15	4.27	17.73	108.6
	0.97		2.12							2.24	14.66		
	1.42	0.41	0.61	0.77		0.30				2.06	4.09	16.95	106.9
	0.93	0.71	0.28	1.01		0.64				5.85	17.20	4.86	126
	1.49	0.28	0.48	0.97		0.40				6.73	19.23	0.23	118.1
	1.84		0.73							3.25	4.47		
	0.90		0.78							5.98	5.43		
	1.48	0.80	0.35	1.16		0.53				3.49	22.73	1.33	127.9
20	0.75			0.78	0.67	2.13	2.78				0.00	0.00	
	2.47	0.34	1.30	0.47						17.14			83.56
30	0.61			0.40	0.27	1.20					2.21	0.00	
00	0.71			0.37	0.24	0.23		0.32			10.28	0.12	
10	0.25			0.30	0.25	1.08		1.52			2.35	0.08	
50	0.51			0.63	0.40	0.05		0.07			9.38	4.33	
20	1.23			1.26	0.83	0.14	0.18				8.52	8.15	
00	0.63			0.27	0.19	0.35			0.53		8.08	6.14	
00	0.69			0.40	0.26	0.05		0.07			2.09	0.26	
30	1.98			0.80	0.67	0.05		0.08			8.05	5.17	
20	0.81			0.70	0.67	0.63		0.88			12.70	0.00	
50	2.31			1.24	0.98	0.13	0.19				4.79	8.76	
30	0.38			0.85	0.65	0.74		1.04			10.80	7.65	
20	1.38			0.71	0.56	0.32	0.42				3.34	3.99	
	0.96	0.07	6.84	0.73						9.75			44.51
00	0.94			0.57	0.35	1.30		1.84			4.16	0.63	
40	0.42			1.23	0.90	0.13		0.19			8.28	14.17	
00	1.13			0.59	0.45	0.77	1.00				4.90	8.10	
	0.76	0.14	0.44	0.65						11.13			50.79
	1.22	0.60	0.70							11.53			57.86
20	1.40			1.05	0.84	0.10		0.14			4.90	0.00	
20	0.75			0.83	0.74	0.11		0.16			6.90	4.57	
	0.77	1.13	1.57	0.68						13.77			70.12
0	0.50			0.27	0.18	0.17	0.15				6.56	0.00	
0	0.22			0.45	0.40	0.14	0.18				4.22	8.57	
0	0.38			0.25	0.17	3.75	4.90				1.12	0.74	
0	0.75			0.40	0.37	0.23	0.30				3.60	14.06	
0	1.12			0.53	0.39	0.25	0.32				2.00	14.76	
	3.45	0.99	0.42	0.39						12.66			75.30
0	0.50			0.23	0.20	0.37	0.49				4.20	12.62	
0	0.24			0.52	0.36	0.08	0.11				2.39	0.37	
0	0.80			0.50	0.35	0.13	0.16				1.24	0.60	
0	0.44			0.58	0.52	0.11	0.14				5.88	0.08	
0	0.50			0.51	0.42	0.12	0.15				5.82	0.07	
	0.32	0.17	2.68	0.53						8.58			38.07
	1.18	0.24	1.66	1.22						6.89			35.32
0	0.44			0.36	0.32	0.60	0.79				3.36	5.74	
0	0.66			0.63	0.44	0.81	1.06				2.56	6.26	
0	0.86			0.98	0.49	1.03	1.35				3.08	1.72	
	0.60	0.14	0.81	0.43						13.47			58.99
	4.46	1.86	1.86	1.64						32.24			167.77
0	3.00			3.16	2.80	9.36			15.33		40.20	0.91	
0	1.41			4.21	3.90	2.60			3.98		0.00	0.00	
0	0.60			0.18	0.12	0.02	0.06				5.73	1.25	

TABLE 7

Analyses of fruit juices (Gibbs and Agcaoili, 1912)

NAME AND CONDITION OF JUICE	DENSITY 15°/15°	SOLIDS	SUCROSE	REDUCING SUGARS	PROTEIN	ASH	ACIDITY CALC. AS CITRIC	ASH		
								NaCl	K_2CO_3	H_2SO_4
		per cent	*per cent*	*per cent*	*per cent*	*per cent*	*per cent*	*per cent*	*per cent*	*per cent*
Calamansi juice		11.55	0.68	1.67	0.83	0.56	4.94	2.53	84.36	2.89
Calamansi juice		8.77	0.68	1.79	0.53	0.24	5.64			
Calamansi juice (sterilized and stored for 8 mo.) not racked		8.77	0.04	1.74	0.36	0.49	5.59			
Calamansi juice (sterilized and stored for 8 mo.) racked	1.0150	8.89	0.03	2.39	0.35	0.59	5.53			
Cajel orange juice	1.0284	6.91	3.75	2.33		0.34	0.29			
Cajel orange juice	1.0360	7.88	3.03	2.47	0.57	0.45	1.80			
Cajel orange juice	1.0160	6.18	1.55	3.34	0.22	0.31	0.32			
Calamondin juice		10.33	0.00	0.53	0.01	0.62	5.52			
Calamondin (pulp)		14.24	0.00	0.41	1.40	0.68	4.79			
California orange juice (Valencia)		11.40	9.20	4.90			1.12			
California orange juice (Washington navel)		12.40 to 15.20	10.10 to 12.55	9.94 to 5.86			0.066 to 1.68			
Lime juice unracked		9.05	0.00	0.50	0.58	0.35	7.77			
Lime juice racked	1.0380	8.83	0.00	0.36	0.48	0.35	7.77			
Lime juice (sterilized and stored for 8 mo.)	1.0390	8.33	0.00	0.02	0.36	0.37	7.38			
Limes (pulp)		12.37	0.00	0.50	0.94	0.66	4.24	1.34	65.69	3.47
Naranjita juice	1.0393	9.40	4.21	4.17		0.34	0.63			
Naranjita juice		9.90	7.00	2.00		0.33	0.35			
Naranjita juice	1.0388	9.12	4.18	2.92	0.52	0.35	1.21			
Naranjita juice	1.0470	10.93	5.19	4.58	0.82	0.43	0.74			
Naranjita juice		11.80	7.11	3.44	0.75	0.48	0.60			
Naranjita juice (8 mo. and 22 days old)		13.03	3.81	8.39	0.33	0.32	0.49			
Naranjita juice (1 yr. and 6 days old)		12.82	0.00	11.46	0.53	0.33	0.80			
Naranjita juice (1 yr. 8 mo. and 13 da. old)	1.0390	8.61	1.54	6.39	0.36	0.20	0.39			
Naranjita juice (1 yr. 8 mo. and 22 da. old)	1.0383	8.83	0.60	7.12	0.21	0.38	0.46			
Naranjita juice (1 yr. 8 mo. and 18 da. old)	1.0675	14.69	2.92	9.98	0.48	0.45	0.70			
Naranjita juice (1 yr. 8 mo. and 7 da. old)	1.0470	10.79	1.71	7.25	0.57	0.38	0.82			

TABLE 8

Analyses of feeds and Philippine grasses used as feed

EXP. STA. NO.	SAMPLE	MOISTURE	FATS	ASH	PROTEIN N×6.25	CRUDE FIBER	CARBOHYDRATES	CALORIES PER 100 GRAMS SAMPLE
		per cent	*per cent*	*per cent*	*per cent*	*per cent*	*per cent*	
285	Copra cake from Philippine Manufacturing Company	13.14	9.42	5.74	17.27	15.54	38.89	317.86
67	Copra meal from Derham Bros.	12.83	5.77	7.26	17.50	15.73	40.91	293.14
260	Copra meal from Bureau of Supply	14.41	11.70	4.81	19.14	18.49	31.45	316.23
284	Copra meal from Philippine Refining Company	8.61	8.14	7.34	19.62	12.30	43.99	336.50
286	Copra meal ground, Philippine Manufacturing Company	10.93	8.29	6.09	18.46	11.94	44.29	334.37
227	Grass, Bayakiboc from Sta. Cruz, right age for feeding	82.59	0.25	2.09	2.74	5.11	7.22	43.16
212	Grass, cogon from College farm, right age for feeding	59.50	1.73	9.05	3.18	13.45	13.09	82.80
273	Grass, cogon from College farm, about to bloom	66.02	0.88	3.42	1.04	12.43	16.21	78.91
281	Grass, cogon from College farm, about to bloom	62.34	0.99	3.26	2.84	13.98	16.59	88.87
289	Grass, cogon from College farm, about to bloom	63.09	0.95	2.63	1.58	13.58	18.17	89.81
315	Grass, culape from College farm, right age for feeding	81.81	1.10	2.22	2.30	6.35	6.22	45.16
63	Grass leaves, guinea from College farm, right age for feeding	81.41	0.65	2.99	1.95	6.39	6.53	41.42
213	Grass leaves, guinea from College farm, right age for feeding	74.99	0.69	3.27	1.07	6.43	13.53	66.36
267	Grass leaves, guinea from College farm, right age for feeding	73.83	0.73	2.67	0.84	6.24	15.69	74.56
314	Grass leaves, guinea from College farm, right age for feeding	67.50	0.49	4.60	3.31	10.07	14.03	75.74
220	Grass, luya-luya from Bay, right age for feeding	72.86	1.18	2.51	1.55	8.53	13.37	72.15
62	Grass, Napier from College farm	87.36	0.17	2.03	1.08	5.36	4.00	22.41
75	Grass, Napier from College farm	88.35	0.27	2.05	1.33	3.28	4.68	27.15
189	Grass, Napier from College farm	79.15	0.27	2.43	1.59	5.38	11.18	54.87
193	Grass, Napier from College farm	91.02	0.13	1.48	2.02	0.62	4.73	28.88
199	Grass, Napier from College farm	89.48	0.57	2.37	1.74	2.08	3.76	27.85
221	Grass, Napier from College farm	93.41	0.11	1.62	1.63	2.79	0.44	9.51
244	Grass, Napier from College farm, 10 day-old	87.48	0.32	2.52	1.85	3.89	4.42	28.68
226	Grass, Napier from College farm, 20 day-old	82.84	0.16	3.60	1.44	5.13	6.83	35.40
228	Grass, Napier from College farm, 30 day-old	82.92	0.43	3.87	1.35	4.99	6.44	35.94
229	Grass, Napier from College farm, 40 day-old	87.76	0.39	2.47	0.95	4.04	4.39	25.52
231	Grass, Napier from College farm, 50 day-old	84.48	0.11	2.53	0.99	4.92	6.97	36.66
236	Grass, Napier from College farm, 60 day-old	85.87	0.34	2.22	1.00	4.96	5.61	30.26
242	Grass, Napier from College farm, 70 day-old	84.18	0.31	2.42	0.75	6.42	5.92	30.23
245	Grass, Napier from College farm, 80 day-old	83.22	0.33	2.41	0.77	6.57	6.72	33.78
252	Grass, Napier from College farm, 90 day-old	79.38	0.13	2.47	0.52	8.27	9.23	41.18
255	Grass, Napier from College farm, 100 day-old	78.34	0.21	3.21	0.93	8.40	8.91	42.30
266	Grass, Napier from College farm, old, full bloom	70.93	0.31	2.44	0.27	8.55	17.50	75.74
272	Grass, Napier from College farm, old, full bloom	72.79	0.65	3.51	1.42	9.25	12.38	62.63
280	Grass, Napier from College farm, young, not in bloom	64.40	1.31	4.79	3.30	10.28	15.92	90.99
288	Grass, Napier from College farm, old, full bloom	67.81	0.72	4.25	1.13	10.04	16.05	77.13
57	Rice bran from Animal Husbandry Department	18.34	2.96	18.56	10.32	10.08	39.74	232.77
68	Rice bran from Basilio Lim	13.81	8.41	15.48	11.56	14.27	36.47	275.14
190	Rice bran from Animal Husbandry Department	17.59	6.52	16.48	11.60	8.65	39.16	268.75
191	Rice bran from Animal Husbandry Department	10.41	12.68	14.46	11.06	7.13	44.26	344.74
257	Rice bran from Biñan	8.43	8.95	11.16	11.74	13.28	46.44	321.77
258	Rice bran from Santa Rosa	11.24	8.23	13.18	10.57	13.57	43.21	297.04
259	Rice bran from Biñang	13.15	9.80	11.11	11.18	11.00	43.76	316.39
225	Roots, cogon from College farm, young and old	68.53	0.86	1.87	0.41	10.53	17.80	82.66

TABLE 9

Analyses of canned milk (Richmond, 1908; Agcaoili, 1913; Dovey, 1913)

	KIND	ANALYSIS NO.	MOISTURE	ASH	LACTOSE	BUTTER FAT	SUCROSE	PROTEIN
			per cent	*per cent*	*per cent*	*per cent*	*per cent*	*per cent*
1.	Bacchus Marsh	5	22.01	1.75	12.53	11.24	43.02	9.45
2.	Bear	2	19.64	1.72	19.78	9.25	41.25	8.92
3.	Berna	1	19.31	1.32	17.20	10.13	42.04	10.00
4.	Dutch Girl	1	25.40	1.82	10.50	9.85	43.49	8.94
5.	Eagle	10	22.40	1.49	13.78	9.11	45.17	8.05
6.	Emery	1	25.69			9.00	42.63	
7.	Flag	1	21.95	1.81	15.94	10.13	41.16	9.01
8.	Fussel's Red Butterfly	2	21.24	1.93	15.50	9.13	43.00	9.20
9.	Gold seal	6	19.27	1.83	15.74	9.94	44.24	8.98
10.	Gruyere castle	1	28.04	1.55	10.16	5.04	46.51	8.70
11.	Harbour	3	29.09	1.77		9.41	41.47	
12.	Hollandia	1	27.33			11.00	42.56	
13.	Libby's	3	26.59	1.64	15.11	8.38	40.69	7.59
14.	Lion	2	24.93	1.84	7.86	9.00	48.00	8.37
15.	Lowood	1	26.65	1.86	9.11	8.80	44.72	8.86
16.	Luzon	1	13.20			11.00	49.38	
17.	Milkmaid	16	22.30	1.92	14.87	9.80	42.27	8.84
18.	Natura	1	22.17			9.25	36.50	
19.	Nurse	1	20.05	1.79	18.62	7.75	44.20	7.65
20.	Red Gate	1	27.25	1.90	12.19	7.92	40.45	10.29
21.	Red Cross	2	30.60	1.55	11.91	8.50	40.09	7.35
22.	Republic	1	23.32			9.60	45.00	
23.	Silver Churn	1	29.95	1.35	13.51	9.79	41.50	3.90
24.	Standard	6	21.80	1.70	15.90	9.60	42.00	9.00
25.	Swiss Farm	1	28.90			9.80	39.07	
26.	Valkyre	1	22.77	1.83	11.13	12.96	42.40	8.91
27.	White Star	3	23.30	1.68	16.04	9.24	40.00	9.74
28.	Axe	1	15.02	2.05	27.97	Trace	45.07	9.89
29.	Buttler	2	16.85	2.31	22.68	Trace	48.06	10.10
30.	Heron	2	21.32	2.41	16.86	0.88	48.55	9.98
31.	Imperial Dove	3	24.18	2.01	17.40	Trace	46.63	9.78
32.	Pigeon	1	26.64				43.41	
33.	Rizal	2	24.45			Trace	54.20	
34.	Royal	1	23.16	2.14	17.17	Trace	47.36	10.17
35.	Star	1	21.70	1.98	17.68	0.38	49.07	9.19
36.	Tiger	1	21.25			Trace		
37.	Volunteer	1	29.70	2.00	10.92	Trace	46.75	10.63
38.	Windmill	1					48.72	
39.	Alpine	6	72.08	1.42	10.74	8.55		7.21
40.	Bacchus Marsh	2	69.74	1.00	10.35	10.42		8.49
41.	Battleship	1	71.50	1.50	10.29	7.20		9.51
42.	Bear	6	67.26	1.76	12.86	9.75		8.37
43.	Cascade	1	73.95	1.20	9.57	8.78		6.50
44.	Cow's Head	3	63.69	2.02	15.07	10.05		9.17
45.	Domestic	1	72.30	1.60	13.40	5.50		7.20
46.	Every day	6	74.21	1.38	9.54	8.30		6.57
47.	Fussel's Silver Butterfly	6	66.78	1.40	13.71	9.48		8.63
48.	Globe	2	70.39			9.59		
49.	Harmens	1	67.10			8.90		
50.	Highland	6	72.75	1.60	10.45	7.75		7.45
51.	Hollandia	1	65.75			7.83		
52.	Libby's	7	73.55	1.24	9.66	8.34		7.21
53.	Lily	1	71.82	1.51	8.54	11.44		6.69
54.	Milka Alpina	1	64.35	1.90		10.64		
55.	Milkina	1	71.02	1.43	10.33	8.80		8.42
56.	Milkmaid	10	67.89	1.71	13.26	9.70		7.44
57.	Mount Vernon	3	70.25	1.43	10.26	9.46		8.60
58.	Natura	2	69.13			8.18		
59.	Peerless	6	71.99	1.55	10.50	8.60		7.36
60.	Pioneer	1	73.62			9.26		
61.	Rizal Day	1	74.32			6.13		
62.	Sego	1	69.92	1.52	11.68	9.78		7.10
63.	St. Charles	5	71.30	1.78	10.44	8.17		8.31
64.	St. George	4	78.91	1.25	7.38	6.67		5.79
65.	Silver Cow	1	70.72	1.30	11.20	8.80		7.98
66.	Viking	1	68.95	1.45		8.24		
67.	Abotritia	1	86.17			5.33		
68.	Anchor	1	88.08	0.64	4.25	3.60		2.33

[illegible]	[illegible]	1	88.08	0.64	4.89	3.40	3.88
69.	Bacchus Marsh	2	87.69	0.61	4.74	3.81	3.15
70.	Bear	15	87.14	0.69	5.22	3.70	3.25
71.	Carnation	1	73.89			7.42	
72.	Champion	1	87.82	0.69	5.26	3.21	3.02
73.	Conqueror	2	88.19	0.62	4.87	3.28	3.04
74.	Dahl's	1	87.25	0.69	5.04	3.43	3.59
75.	Dragon	4	87.49	0.58	5.00	3.62	3.31
76.	Dutch Girl	1	87.77	0.66	5.18	3.32	3.07
77.	Elks	1	88.14	0.59	4.36	3.87	3.04
78.	Eury	1	86.46	0.69	4.10	4.98	3.77
79.	Flying Tiger	2	88.02	0.66	4.89	3.24	3.19
80.	Fussel's Green Butterfly	6	87.20	0.67	4.98	3.78	3.37
81.	Golden Cow and Calf	1	87.65	0.58	5.06	3.56	3.15
82.	Golden Harp	1	87.60			3.70	
83.	Gruyere	1	88.15			3.74	
84.	Gu La	1	87.63	0.62	5.82	2.82	3.11
85.	Jura	4	87.64	0.58	5.01	3.71	3.06
86.	Locati-triulzi Co.	1	86.40	0.70	4.77	4.05	4.08
87.	Manoc	3	89.29	0.57	4.39	3.13	2.62
88.	Milkmaid	20	87.29	0.68	5.11	3.68	3.24
89.	Mount Seny	1	89.15	0.68	5.19	1.94	3.04
90.	Natura	8	87.51	0.65	4.88	3.68	3.28
91.	Nutricia	2	87.79			3.29	
92.	Rowboat	1	88.82	0.55	4.72	2.97	2.94
93.	Swimmer	2	88.58	0.68	4.80	3.17	2.77
94.	Tropic proof	1	89.00			2.14	
95.	Union	2	88.03	0.62	4.75	3.53	3.07
96.	Vaca	2	87.65	0.63	5.09	3.39	3.24
97.	Vaca milk	1	87.97			3.30	
98.	Victoria	1	88.29			2.89	
99.	White swan	1	87.60			4.04	
100.	Bear	6	57.52	0.42	2.36	37.61	2.09
101.	Berna	1	88.29	0.58	5.11	3.35	2.67
102.	Dahl's	1	70.90	0.49	4.12	21.60	2.89
103.	Dragon	3	69.49	0.54	4.71	22.50	2.76
104.	Fussel Golden Butterfly	3	62.38	0.47	3.54	31.23	2.38
105.	Horlicks malted milk	4	4.03	4.08		8.18	16.64
106.	Lion	1	64.65	0.35	0.55	32.40	2.05
107.	Milkmaid	10	64.74	0.77	3.52	23.07	2.90
108.	Shane	1	81.07	0.46	3.59	11.90	2.98
109.	3-C (dried milk)	4	3.07	4.94	52.05	24.44	15.50
110.	Trumlich (dried milk)	2	1.70	3.93	35.05	31.67	27.65
111.	Valkyrie	1	63.04	0.68	2.88	30.60	2.80

NOTE:—From 1 to 27—Sweetened condensed milk.
From 28 to 38—Sweetened condensed skim milk.
From 39 to 67—Unsweetened condensed milk.
From 68 to 99—Sterilized natural milk.
From 100 to 111—Creams and dried milks.

TABLE 10

Analysis of fresh milk (Mendoza, 1917)

EXP. STA. NO.	KIND	SP. GR.	MOISTURE	TOTAL SOLIDS	ASH	LACTOSE	BUTTER FAT	PROTEIN N X 6.38	CASEIN
		per cent	*per cent*	*per cent*	*per cent*	*per cent*	*per cent*	*per cent*	*per cent*
	Carabao	1.0340	84.58	15.42	0.90	4.61	5.25	4.66	4.30
	Carabao	1.0390	80.39	19.61	0.79	5.20	8.10	5.52	5.04
	Carabao	1.0260	82.25	17.75	0.69	5.40	6.55	4.91	4.00
	Carabao	1.0320	75.73	24.27	0.91	4.60	12.90	5.86	5.40
	Carabao	1.0400	83.32	16.68	0.61	5.21	5.95	4.91	4.50
	Carabao	1.0340	81.66	18.34	0.88	5.10	7.85	4.51	4.00
	Carabao	1.0410	82.88	17.12	0.85	5.32	6.60	4.35	4.00
	Carabao	1.0290	84.56	15.44	0.77	4.85	5.10	4.72	4.30
	Carabao	1.0430	82.49	17.51	0.86	5.83	6.00	4.82	4.10
	Carabao	1.0310	84.24	15.76	0.80	5.45	4.10	5.41	4.90
310	Goat	1.0319	85.59	14.41	0.83	5.20	4.58	3.75	
165	Indian buffalo (20)[a]	1.0318	85.49	14.51	0.72	4.85	2.20	2.91	
166	Indian buffalo (1240)	1.0301	85.77	14.23	0.20	4.66	4.50	4.38	
167	Indian buffalo (3)	1.0318	75.66	24.34	0.28	3.83	12.10	3.71	
168	Indian buffalo (381)	1.0311	75.28	24.72	0.22	4.60	10.40	4.67	
174	Indian buffalo (1240)	1.0065	86.33	13.67	0.47	6.42	4.25	3.22	
175	Indian buffalo (20)	1.0280	86.64	13.46	0.66	5.03	4.65	4.44	
176	Indian buffalo (381)	1.0319	83.09	16.91	0.70	6.10	6.25	4.29	
180	Indian buffalo (1)	1.0169	83.60	16.40	1.03	5.38	4.50	4.23	
181	Indian buffalo (366)	1.0121	80.34	19.66	0.99	5.52	4.15	4.22	
182	Indian buffalo (381)	1.0282	82.31	17.69	0.84	5.40	6.45	4.16	
183	Indian buffalo (1240)	1.0305	87.02	12.98	0.67	5.46	4.55	2.78	
302	Mare's (Amazon)	1.0338	91.05	8.95	0.36	6.63	1.05	1.68	
349	Mare's (Amazon)	1.0331	90.38	9.62	0.41	6.73	1.90	1.47	
368	Mare's (Amazon)	1.0381	90.67	9.33	0.49	5.28	1.30	2.26	1.09
380	Mare's (Amazon)	1.0334	91.16	8.84	0.32	6.40	1.00	1.75	1.05
385	Mare's (Amazon)	1.0324	90.54	9.46	0.34	6.50	1.10	1.90	1.20
388	Mare's (Amazon)	1.0309	91.89	8.11	0.31	6.90	0.80	1.60	1.00
394	Mare's (Amazon)	1.0337	89.31	10.69	0.38	6.60	2.20	2.07	1.19
398	Mare's (Amazon)	1.0365	89.83	10.17	0.39	7.10	1.05	2.15	1.73
408	Mare's (Amazon)	1.0350	89.83	10.17	0.35	6.90	1.30	2.09	1.36
424	Mare's (Amazon)	1.0337	89.77	10.12	0.35	6.60	1.20	2.11	—
432	Mare's (Amazon)	1.0352	89.69	10.31	0.27	7.10	1.50	2.97	1.32
446	Mare's (Amazon)	1.0334	89.78	10.22	0.32	6.20	1.30	1.94	
498	Mare's (Amazon)	1.0319	89.31	—	0.29	5.60	2.20	1.80	0.42
506	Mare's (Amazon)	1.0328	91.30	8.70	0.28	6.90	1.35	1.83	1.09
497	Mare's (Mermaid)	1.0333	89.78	—	0.35	6.10	1.70	1.77	0.45
507	Mare's (Mermaid)	1.0328	90.56	9.40	0.32	6.80	1.50	1.78	

[a] Figures in parentheses refer to College number of animals.

TABLE 11

Analyses of roots and tubers (Labayen, 1914; Quisumbing, 1914[a], 1914[b])

VARIETIES	SP. GR.	MOISTURE	ASH	STARCH	SUCROSE	GLUCOSE REDUCING SUGARS	PROTEIN	YIELD IN GRM. PER HECTARE	DEXTRIN	CRUDE FIBER	HYDROCYANIC ACID IN BARK	HYDROCYANIC ACID IN EDIBLE PORTION	FAT	UNDETERMINED	P	K
		per cent	*per cent*	*per cent*	*per cent*	*per cent*	*per cent*		*per cent*	*per cent*	*per cent*	*per cent*	*per cent*	*per cent*	*per cent*	*per cent*
Amorosa 336	1.06	69.63	0.97	19.87			0.88	10,400								
Beattie 1627	1.04	76.12	0.72	15.44			0.50	6,300								
Beriberi 346	0.99	75.28	0.88	16.39	0.53	0.28	0.69	11,050	3.56	.68						
Bigstem Jersey 1454	1.02	74.67	0.90	15.79												
Bolliza 44		69.67	1.35	20.03		0.61	0.89		0.96	0.65			0.13	5.75		
Bumatus 1077	1.08	72.46	1.00	19.99												
Caagarao 1066	1.09	66.74	0.97	24.67	1.70	0.26	0.63	11,200	3.28	1.02						
Cabulan 1065	1.10	66.15	1.00	24.02	1.35	0.56	0.69	4,200	4.34	.88						
Cahodo 1073	1.12	67.10	0.77	21.28			0.69									
Caigbao 1068	1.16	65.69	0.99	25.45	0.77	0.40	1.06	6,000	4.35	.70						
Calut or nami 331		78.29	3.18	77.60	1.57	1.11	8.31		4.29				0.74	3.20		
Calut or nami 1103		78.13	3.25	77.09	1.95	1.16	8.11		3.89				0.74	3.81		
Camiang 341	1.08	71.99	0.93	18.86	0.57	0.39	1.56	11,000	3.45	.97						
Canegro 1074	1.11	66.98	0.87	22.90	0.59	0.32	0.50	9,600	4.78	.97						
Cassava, white petioled variety		67.84	4.15	24.88	Traces		1.13		Traces	1.795	0.043	0.023				
Cassava, red petioled variety		67.11	3.81	25.79	Traces		1.312		Traces	1.816	0.046	0.028				
Cassava, intermediate variety		69.39	3.15	23.82	Traces		1.13		Traces	2.27	0.048	0.023				
Colocassia dasheen 437		80.65		2.35			1.57									
Col. dasheen, Porto Rico No. 17, 432		73.64		6.12			1.02									
Col. kelly No. 6, 433		70.68		6.33			2.05									
Dasheen, Calamba 1848		70.04		5.35			1.44									
Dasheen, Laguna 947		73.62		4.99			2.45									
Dashen, Los Baños 308		70.88		13.37			1.82									
Dasheen 308, Los Baños, main tuber		74.70	0.42	15.77		0.41	1.73		0.88	0.48			0.11	5.50		
Dasheen 303, Las Baños, side tubers		71.80	2.25	16.20		0.38	1.41		0.78	1.14			0.09	3.00		
Dasheen, Malabong Puti 950, main tuber		80.56	1.64	11.51		0.50	0.91		1.43	0.66			0.08	2.73		
Dasheen, Malabong puti 950, side tuber		77.62	0.46	14.35		0.26	1.58		4.03	0.95			0.20	0.55		
Dasheen, Mindoro 495		67.07	1.35	18.01		0.45	1.42		1.92	0.44			0.20	0.05		
Dasheen, Mindoro 495		61.05		25.04			1.65									
Dasheen puti 945		72.53		6.32			2.85									
Dasheen white edda 341		71.66		7.16			2.04									
Rough Samar 310		66.10	1.17	20.38		1.41	1.00		3.50	0.76			0.35	5.53		
Gabi, wild variety 586		69.28		6.63			2.01									
Gabi leaves		55.00					30.94								0.145	0.350
Gabi petiole		84.00					3.69								0.045	0.220
Gabi, main tuber		85.00					5.44								0.057	0.120
Gabi, entire plant							11.25								0.061	0.120
Guinarosa 1070	1.09	65.57	1.34	24.68												
Guinarosa 1070	1.06	63.08	0.90	26.30	2.03	0.55	0.81	5,500	4.77	1.17						
Inigcanto 337	1.10	75.75	0.81	15.64	0.65	0.33	2.44	17,000	2.21	.87						
Kinawayan 1076	1.10	70.04	0.89	20.37	1.59	0.81	0.94	11,000	3.18	.84						
Manila pula 349	1.05	71.38	0.79	18.60				10,300								
Maragandang 350	1.06	65.98	0.99	21.87	1.06	0.52	0.56	11,000	5.56	.46						
Melakeña 1072	1.10	70.26	1.81	20.27	1.07	0.67	0.88	12,500	4.32	.70						
Montivedeo 115	1.09	72.79	1.01	15.57												
Quenodiapa 3432	1.11	73.83	0.92	14.58			0.25									
Red Samar 334	1.10	77.99	0.91	10.11			0.50									
Samar Big Yellow 333	1.06	69.06	0.92	19.62				24,160								
Sinamporado 1071	1.11	65.08	0.96	25.65	1.38	0.21	0.88	9,600	4.18	.82						
Sweet potato tubers		71.57	1.07				0.92			0.78			0.40			
Talban tuberculo 121		87.09		2.75			1.61									
Tinampay 1075	1.07	68.63	2.04	20.77	1.51	0.86	0.44	8,500	4.02	1.03						
Tinogabang 1078	1.16	65.63	0.74	25.91	1.22	0.42	0.56	12,600	3.58	.94						
Tubayan 957		71.04	4.71	83.99	0.88	0.85	6.25			2.70			0.51	0.11		
Tugui 922		70.22	3.12	83.49	4.31	1.51	4.53			2.52			0.44	0.08		
Tugi or Appari 1101		82.63	3.97	70.94	9.20	2.42	6.79			3.97			1.67	1.04		
Tugi or Appari 1098		69.07	2.94	82.30	4.76	1.71	5.04			2.52			.71	0.02		
Tugi-D. tiliaefolia 88-S		79.49	3.27	68.46	11.60	2.61	7.10			3.17			1.42	2.36		
Tugi-D. tiliaefolia		76.67	5.28	78.54	5.92	1.34	5.54			2.90			0.47	0.01		
Ubi, Binakasan 329		69.75	3.26	80.47	1.58	1.14	6.76			2.15			0.78	3.86		
Ubi, Kinahayna puti		67.32	3.64	83.04	1.10	0.55	5.23			1.99			0.80	3.65		
Ubing labok 1561		75.29	4.25	78.00	2.06	1.05	7.36			2.91			0.73	3.64		
Ubi, Tinugi 954		76.32	3.85	76.44	4.38	1.86	7.97			3.70			1.11	0.60		
Unknown Leyte 1081	1.09	72.10	0.81	14.33			0.31									
Unknown Leyte 1080	1.10	69.92	1.02	21.30	2.42	0.46	0.81	14,200	3.01	.68						
Unknown Leyte 1081	1.12	64.44	0.84	25.30	1.08	0.98	0.56	9,500	3.75	1.18						
Unknown entire plant							6.31								0.051	0.210
Yautia leaves		85.50					13.63								0.083	0.270
Yautia main tuber		85.00					2.88								0.053	0.230
Yautia petiole		9.20					2.31								0.041	0.260
Yautia side tuber		89.00					2.88								0.060	0.180

Yautia banana thin 438		64.45		11.06		0.78									
Yautia Grey Jack 443		67.47		11.66		1.46									
Yautia Malanga Blanca		73.01		16.19		0.51									
Yautia My lady 441		71.74		8.65		1.15									
Yautia Prieta or morado		49.31		33.71		2.34									
Yautia Punyera 436		64.42		21.42		1.53									
Yautia Rolliza 444		58.49		27.89		1.67									
Yautia Rolliza blanca 309		69.04		19.05		1.49									
Yautia Taro Royal 442		71.49		6.02		1.25									
Yautia Trinidad 439		66.36		22.47		1.20									
Yautia, unknown variety 589		74.95		15.46		0.98									
Yautia, unknown variety main tuber 587		76.09		13.46		1.76									
Yautia, unknown variety side tuber 587		66.78		8.07		2.32									
Yautia, unknown variety main tuber 588		64.93		21.74		1.53									
Yautia (white Tamma) 434		62.53		15.14		1.00									

TABLE 12

Analyses of some common Philippine vegetables (Agcaoili, 1916)

EXP. STA. NO.	NAME	WATER	ETHER EXTRACT	ASH	PROTEIN N×6.25	CRUDE FIBER	CARBOHYDRATES BY DIFFERENCE	CALORIES PER 100 GRAMS SAMPLE
	FRUITS	*per cent*	*per cent*	*per cent*	*per cent*	*per cent*	*per cent*	*per cent*
	Amargoso (ampalaya)[a], Momordica charantia L.	92.73	0.03	0.68	1.26	0.12	5.18	26.68
	Batao (batao), Dolichos lablab L.	87.56	0.25	0.95	3.32	1.73	6.19	41.32
	Bottle gourd (opo), Lagenaria leucantha (Lam.) Rusby	95.44	0.09	0.37	0.50	0.26	3.34	16.58
	Breadfruit (camansi), Artocarpus communis L.	89.16	0.55	0.88	2.24	1.09	6.08	39.23
	Chick pea (garabanzos), Cicer arietinum L.	13.63	5.38	2.86	19.94	2.26	55.93	361.11
	Common bean (habichuelas), Phaseolus vulgaris L.	15.07	1.70	3.80	18.09	4.28	57.06	323.93
	Cowpea (sitao), Vigna sesquipedalis L.	86.75	0.18	0.90	2.65	2.03	7.49	45.25
	Cowpea seed (mungo), Phaseolus mungo.	9.21	0.88	4.23	18.30	4.89	62.49	339.42
	Cucumber (pepino), Cucumis sativus L.	94.14	0.19	0.46	0.52	0.30	2.39	13.70
	Eggplant (talong), Solanum melongena L.	90.98	0.45	0.54	1.07	0.82	6.14	43.75
	Horse radish tree (malungay), Moringa oleifera Lam.	88.24	0.16	0.94	7.29	0.76	2.61	32.08
	Lima bean (patani), Phaseolus lunatus L.	65.50	1.26	1.84	7.30	0.77	23.37	137.47
	Mungo seed (Japanese mungo), Phaseolus aureus Roxb.	14.70	0.93	3.01	20.44	4.36	56.56	324.35
	Papaya (papaya), Carica papaya L.	93.98	0.17	0.41	1.09	0.65	3.70	21.22
	Sponge gourd (patola), Luffa cylindrica Roem.	94.58	0.13	0.28	0.63	0.13	4.25	21.22
	Sprouted cowpea (togue), Phaseolus mungo	92.85	0.45	0.41	2.38	0.69	3.91	29.98
	Squash (calabaza), Cucurbita maxima Duchesne	87.20	0.43	1.01	1.33	0.70	9.33	47.71
	Sugar pea (guisantes), Pisum sativum L.	85.08	0.26	0.72	3.88	1.35	8.71	54.04
	Tomato (camatis), Tomato sp.	94.32	0.23	0.62	0.99	0.64	3.20	19.12
	Tomato (camatis ligao), Tomato sp	90.59	0.19	1.03	1.76	2.38	4.05	25.59
	Wax gourd (condol), Benincasa cerifera Savi.	95.90	0.46	0.37	0.17	0.54	2.26	15.47
	Winged bean (ciguidillas), Psophacarpus tetragonolobus	91.70	0.53	0.62	1.83	—	—	—
	LEAVES							
	Amargoso (ampalaya), Momordica charantia L.	81.94	0.13	2.06	2.30	0.75	16.82	79.60
	Balunsay, fresh leaves (tips)	89.23	0.52	1.67	3.22	1.47	3.89	33.99
	Cabbage (repollo), Brassica oleracea L.	91.86	0.28	0.79	2.03	0.91	4.13	27.86
	Cancong (cancong), Ipomea reptans Poir.	89.70	0.04	1.67	4.25	0.70	3.64	32.72
	Celery (kinchay), Apium graveolus L.	92.72	0.32	1.56	1.65	0.86	2.89	21.50
	Chinese mustard (mustaza), Brassica juncea L.	91.30	0.31	1.10	2.06	0.80	4.43	30.49
	Coriander (unsuy), Coriandrum sativum L.	90.82	0.41	1.38	2.17	0.79	4.43	30.87
	Cowpea (sitao), Vigna sinensis (L) Savi. et Haask.	85.88	0.40	1.58	4.07	1.90	6.17	45.91
	Endive (escarola), Chichorium endivia.	93.25	0.23	0.94	1.62	0.95	3.01	21.12
	Fern (paco), Athyrium esculentum	90.78	0.28	1.14	3.11	1.23	3.54	29.87
	Garlic (bauang), Allium sativum L.	88.01	0.32	1.03	2.20	1.17	7.27	41.78
282	Kulasiman, fresh leaves (tips)	93.06	0.15	2.14	1.69	0.62	2.34	14.92
	Horse radish tree (malungay), Moringa oleifera Lam.	76.67	1.10	2.14	7.30	1.75	11.04	85.43
274	Malungay (leaves), fresh leaves (tips)	77.47	2.68	2.16	5.80	2.14	9.75	88.68
277	Malungay (leaves), fresh leaves (tips)	76.31	1.74	2.18	5.66	2.05	12.36	88.83
278	Malungay, fresh leaves (tips)	77.30	1.47	2.07	5.62	2.64	10.90	81.40
279	Malungay, fresh leaves (tips)	79.90	1.86	1.60	5.02	1.52	10.10	79.29
	Leek (cuchay), Allium porrum L.	91.92	0.55	0.92	1.88	1.10	3.63	27.71
269	Paco, fresh leaves (tips)	89.98	2.62	1.36	3.51	1.08	1.45	44.70
	Parsley (peregil), Petroselinum sativum.	85.70	1.39	2.75	3.82	1.52	4.82	49.35
	Pasao (pasao), Corchorus oliterium L.	80.61	0.44	2.77	5.07	1.81	9.30	63.01
	Pechay (pechay), Brassica chinensis L.	92.97	0.34	1.26	1.00	0.79	4.64	26.29
	Pepper (sili), Capsicum annum L.	84.63	0.70	2.25	5.48	0.34	5.60	51.98
	Pigweed (culitis), Amaranthus oleraceus	83.35	1.71	2.44	3.98	1.53	6.99	60.87
	Pigweed (colis maluco), Amaranthus oleraceous.	81.38	0.57	3.16	4.50	2.00	8.39	58.15
	Squash (calabaza), Cucurbita maxima Duchesne	89.45	0.34	1.87	4.07	1.16	3.11	32.60
	Sweet potato (camote), Ipomea batatas L. Poir.	84.20	0.42	1.93	1.15	1.90	10.25	50.52
172	Sweet potato (leaves), fresh leaves (tips).	85.42	0.14	1.70	2.76	3.50	6.48	39.19
283	Uray babae, fresh leaves (tips)	78.89	0.78	3.55	6.24	1.47	9.07	70.03
	Young onion (sibuyas); Allium cepa.	89.14	0.34	0.74	1.27	1.80	6.71	35.88
	ROOTS							
	Carrot (carot), Daucus carota L.	86.36	0.23	0.80	2.26	1.27	9.08	48.63
	Cassava (camoteng cahoy), Manihot utilissima Pohl.	—	—	—	0.82	—	—	—
	Chinese radish (rabanus), Raphanus sativus L.	94.14	0.16	0.69	0.82	0.55	3.64	19.78
	Pongapong (pongapong), Amorphophallus campanulatus Blum.	74.81	0.38	0.73	5.10	0.61	14.77	85.00
	Sweet potato (camote), Ipomea batatas L. Poir.	71.20	0.52	0.91	0.65	1.35	23.37	103.32
	Taro (gabi), Colocasia antiguorum Schott.	63.21	0.39	1.01	1.29	1.59	33.51	145.71
	Yam (ubi), Dioscorea spp.	63.70	0.05	1.45	2.86	1.03	27.31	124.16
	Yam bean (sincamas), Pachyrrhizus erosus (L.) Urb.	84.47	0.12	0.38	0.82	0.28	8.93	41.09
	Yam (tugui), Dioscorea esculenta (Lour.) Burk.	67.49	0.19	1.07	1.50	0.95	18.80	85.00
	SHOOTS							
	Bamboo (labong), Caña sp.	92.77	0.51	0.55	1.76	0.17	4.24	29.34
	FLOWERS							
	Banana (puso), Musa sapientum L.	92.67	0.31	1.02	1.99	0.66	3.35	22.78
	Caturay (caturay), Sesbania grandiflora (L.) Pers.	88.75	0.92	0.79	1.97	—	—	—

[a] Common names in parentheses.

A STUDY OF THE MEAT SUPPLY OF THE CITY OF MANILA[1]

CANUTO G. MANUEL

WITH ONE TEXT FIGURE

INTRODUCTION

As the city of Manila is the largest meat market in the Philippines, the methods of handling its meat supply are important and worthy of study. To know the practices involved from the purchase of the animals to the distribution of the meat is desirable, especially for those interested in animal husbandry.

Objects of the present work

This survey was conducted to gather information on the following points: (*a*) Kind, origin, and number of animals, except poultry, slaughtered for meat; (*b*) Ways of purchasing and transporting animals; (*c*) Pre-slaughter management; (*d*) Slaughter houses; (*e*) Methods of slaughtering; (*f*) The system of inspection; (*g*) Post-mortem findings of diseased animals; (*h*) Distribution and marketing of meats; (*i*) Disposal of offal and hide.

Time and place of the work

The work was begun in the month of September, 1922, and ended in February, 1924. The abattoirs studied in this work are those of Pandacan, Manila, and Sisiman. The different Manila markets including Divisoria, Quinta, Paco, Arranque, Obreros, San Andrés, and others were visited to obtain information on the marketing part of the survey.

Review of past literature

Very little has been written regarding the meat supply of the city of Manila. Noguera (1918) made a study of the system of slaughtering hogs at the Manila matadero during the years 1916-1918. In 1922, Buencamino published an article on the meat supply of the Philippines in which he brings out the nature of the hide, the origin and number of cattle brought for slaughter from different parts of the Islands and from foreign countries.

DISCUSSION OF RESULTS

(*See tables 1 and 2 on following page*)

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[1]Thesis presented for graduation, 1924, with the degree of Bachelor of Agriculture from the College of Agriculture No. 200; Experiment Station contribution No. 297. Prepared in the Department of Animal Husbandry under the direction of Assistant Professor V. E. Villegas.

The writer wishes to express his thanks to Dr. Victor Buencamino of Manila for his valuable assistance during the progress of the survey.

TABLE 1

Number of animals imported into and number slaughtered in the city of Manila [a]

KIND OF ANIMALS	1919		1920		1921		1922		AVERAGE FOR ONE YEAR	
	NUMBER OF ARRIVALS	NUMBER SLAUGHTERED	NUMBER OF ARRIVALS	NUMBER SLAUGHTERED	NUMBER OF ARRIVALS	NUMBER SLAUGHTERED	NUMBER OF ARRIVALS	NUMBER SLAUGHTERED	Arrivals	Slaughtered
Cattle	24,084	22,656	26,915	25,841	30,679	30,465	25,591	24,888	26,817	25,964
Hogs	124,813	109,118	123,438	109,682	116,509	103,199	119,955	115,034	121,179	109,258
Goats	1,717	1,276	1,848	1,476	2,113	1,896	2,259	2,092	1,984	1,685
Sheep	269	80	210	65	127	29	293	61	225	59

[a] From a letter to the author from the Director of Agriculture, November, 1923.

TABLE 2

Shipping ports of cattle arriving in the city of Manila.[a]

PORT OF EMBARKATION	1919	1920	1921	1922	AVERAGE
Philippines	14,035	10,593	6,087	10,630	10,336
Pnom-Penh	9,081	14,316	19,901	14,526	14,456
Hongkong	899	1,968	3,236	206	1,577
Saigon	52				13
Siam			691		173
Australia	14	38	757	229	259
Total	24,081	26,915	30,672	25,591	26,814

[a] From the Collector of Customs to the writer in the form of a letter. April, 1923.

Cattle

Table 1 shows that in the city of Manila in the years 1919-1922, inclusive, there was an average of 26,817 cattle imported and 25,963 head slaughtered a year. The tran-shipping of a number of animals to be used for work and for breeding, etc., accounts for the discrepancy in the figures. Also, there is a considerable amount of home slaughter of the small animals.

Buencamino (1922) classifies the beef cattle supply of the city of Manila into foreign and native stock. Foreign stock includes that from China, Indo-China, and Australia. Hongkong and Tsingtao are the principal cities in China from which foreign animals are obtained; from Indo-China they are obtained at Pnom-Penh (Cambodia) and Qui-Nhon (Annam); and from Australia, they are shipped at Wyndham and Darwin. One or two shipments a year are sometimes received from Saigon, Indo-China, and from Siam.

Hongkong cattle. In the years 1919-1922, inclusive, there were imported into the city of Manila, Hongkong cattle averaging 1577 a year (see table 2). Buencamino states that these animals are docile because of the care they receive from the Chinese who use them for work purposes before they sell them. These cattle suffer but little on the voyage from Hongkong to the Philippines. Their conformation is blocky, suggesting that of a work animal. According to Buencamino the average dressed weight of these animals is 136 kilograms, giving a dressing percentage of approximately 45 to 55. The carcass is whitish in color. The hide is thick.

Tsingtao cattle. These are large-sized animals outweighing the Hongkong cattle. They have a large frame-work and average about 200 kilograms dressed weight with plenty of yellow fat. Their defect lies in the large proportion of bone to meat.

Pnom-Penh cattle. These animals are taller than the Hongkong cattle and have larger bones. Hence, a larger proportion of the dressed weight goes into bones which lessens the actual amount of edible beef. Buencamino states that these cattle are perhaps the best for all round purposes. They range in age from five to seven years. The average dressed weight is about 146 kilograms and the carcass appears to be laden with plenty of yellow fat. These animals are, however, not so docile as the Hongkong cattle. They are very hardy, thrive well on rice straw, and stand the hard knocks of the voyage very well. As beef cattle, they have a good reputation in the Manila market and the meat from them is acceptable to the retail dealers.

According to table 2, the total number of cattle imported from Pnom-Penh (Indo-China) alone, exceeds the total number of cattle from all other ports brought to Manila for slaughter during the three years (1920 to 1922). The same table shows that Philippine cattle brought to Manila decreased from 14,035 in 1919 to 6,087 in 1921. This decrease is counterbalanced by the increase of imported Pnom-Penh cattle from 9,081 in 1919 to 19,901 in 1921. It is interesting to note that the cattle coming from Pnom-Penh and those from different parts of the Philippines bear a supplementary relationship, maintaining a total supply of approximately 25,000 head.

Siam and Saigon cattle. In 1919, 52 head of Saigon cattle were brought to the city of Manila, while in 1921, 691 Siam cattle arrived in this port.

Annam cattle. As a general rule, these cattle are smaller than those from Pnom-Penh, giving an average dressed weight of a little over 100 kilograms. A slight amount of fat may be seen on the carcass. These animals are similar in disposition to the Pnom-Penh cattle.

Australian cattle. These represent the largest specimens of beef cattle imported into Manila. They come from the northern territory of Australia, where they are raised under range conditions, the ranches being 200 to 400 miles from the ports, Wyndham and Darwin. When they are ready for shipping, these animals are driven to the loading ports at the rate of 56 miles a week. Being from the ranges, they are wild and consequently are hard to handle. The dressed weight ranges from 260 to 270 kilograms and even higher, dressing about 40 to 60 per cent. The meat contains a good deal of yellow fat which many times counts against a desirable beef carcass (Buencamino, 1922).

At the time of this survey few live cattle were imported from Australia, but refrigerated beef and veal came in large quantities from the southern ports, rivaling the local supply of beef from native and imported stock. The number of Australian cattle brought to Manila in 1919-1922 was 14 in 1919, 38 in 1920, 757 in 1921, and 229 in 1922[2].

TABLE 3

Showing average of data obtained from five animals slaughtered

ORIGIN	DRESSED WEIGHT			SELLING PRICE OF HIDE	SELLING PRICE OF OFFAL	SELLING PRICE WHOLESALE PER KGM.		TOTAL RETURNS PER ANIMAL
	Fore	Hind	Total			Fore	Hind	
	kgm.	*kgm.*	*kgm.*	*pesos*	*pesos*	*pesos*	*pesos*	*pesos*
Masbate (large)	71.6	82.6	154.2	9.50	16.00	0.63	0.73	130.91
Ilocos Sur	72.0	81.0	153.0	9.50	16.00	0.63	0.73	129.99
Batangas	64.4	85.8	150.2	10.00	14.40	0.85	0.95	160.65
Palawan	50.2	68.4	118.6	8.80	12.60	0.45	0.55	81.61
Mindanao	50.2	61.2	111.4	10.00	14.00	0.44	0.54	79.14
Tayabas	43.0	51.8	94.8	9.60	10.40	0.43	0.53	65.94
Dalupiri	37.8	43.8	81.6	5.50	8.00	0.43	0.53	52.97
Mindoro	37.6	42.0	79.6	5.00	8.00	0.45	0.55	53.02
Masbate (small)	38.6	40.4	79.0	5.00	8.50	0.49	0.59	56.25
Fuga	23.4	26.6	50.0	4.50	7.00	0.38	0.48	33.16

Philippine cattle. The native stock slaughtered in Manila comes regularly from the provinces of Batangas, Tayabas, and Rizal, and from time to time from Ilocos Sur, Ilocos Norte, Marinduque, Burias, Tablas, Dalupiri Island, Fuga Island, Babuyan Island, Masbate, Mindoro, and Palawan. From the Visayas, cattle are brought to Manila from Capiz and Leyte; from Mindanao, they are brought from provinces of Davao, Cotabato, Bukidnon, and Jolo. From these places, according to table 2, from 6,087 to 14,035 head are brought to Manila, yearly.

[2] Australia supplies at present (March, 1925) 60 per cent of the beef consumed in Manila. The cattle are brought alive and slaughtered at the Sisiman Quarantine Station. For the fiscal year ending June 30, 1923, 2,035 head of cattle were imported from the Northern Territory, Australia. It has increased since then to approximately 8,000 in 1924. From April 1, 1925, for one year, 40 per cent of the fresh beef supply of Manila will come from Northern Australia, by special administrative arrangement. This will mean approximately 7,000 head.—B. M. G.

Observations were made on the dressed weight and selling price of the different parts of five animals brought to the Manila matadero from each of the important sources of cattle. The results of these observations are summarized in table 3. No live weight could be taken as there were no stock scales at the slaughter house.

Batangas cattle: These animals are rather blocky and as a rule have been used for work before they are shipped to Manila for meat purposes. In weight and quality of meat they approximate the imported foreign cattle. Because of the short distance they have to be transported, they arrive in Manila in good condition and the loss from shrinkage is far less than with the other live stock coming from more distant places (Buencamino). The average dressed weight is about 150 kilograms. In general, the carcass contains plenty of fat. The market price of the hide is fairly constant, at ₱10.00. The selling price of offal varies slightly but averages around ₱14.40. The price per kilogram of both fore and hind quarters differs, the average being ₱0.85 for the former and ₱0.95 for the latter. The average selling price of the carcass, hide, and offal is approximately ₱160.

Ilocos Sur cattle: In weight, these cattle, the large Masbate, and the Batangas may be rated second only to foreign cattle. The body is of fair conformation and is covered with a reasonable amount of flesh. The average dressed weight is about 150 kilograms. The hide brings on the average ₱9.50, and the offal ₱16. The total proceeds from the carcass, hide, and offal is, on the average, ₱130. These data apply to Ilocos Norte cattle, also.

Tayabas cattle: The cattle from Tayabas Province vary in size. Some are small while others are very large; some of the small animals being only about half the size of the largest. The average dressed weight is about 95 kilograms. The prices of the hide is, on the average, ₱9.60 while the offal brings, on the average, ₱10.40 per head. The average selling price of the carcass, offal, and hide is about ₱66.

Masbate cattle: These cattle may be groupéd into two classes, the large and the small. The animals of large type are believed to be the offspring of government bulls that were used for breeding purposes in that island some time ago. The small type animals are said to come from the ranges where they breed promiscuously. The average dressed weight of the large type is about 155 kilograms. The selling price of the hide is about ₱9.50 and the offal, ₱16. This type of animal returns on the average ₱130 per head.

Mindoro cattle: These animals are small and usually wild because they are raised as range animals. The Mindoro, the Dalupiri, and the Masbate cattle are about the same in size. The average dressed weight is about 80 kilograms. As these animals are small, the hide brings on an average only ₱5 a head. The average selling price of offal is only ₱8. The average selling price of the animal as a whole including dressed carcass, hide, and offal is around ₱53.

Dalupiri cattle: From Dalupiri Island north of Luzon comes a type of cattle poor in size, conformation, and condition compared with other strains of native cattle. The average dressed weight is about 82 kilograms. The selling price of the hide is on an average ₱5.50 and the offal, ₱8. According to Buencamino these animals are raised on the range and consequently are more or less wild so that upon arrival in Manila they are thin and haggard. The meat

is dark in color and inferior in quality and is not well liked by the people. Five random specimens brought approximately ₱53 each.

Fuga Island cattle: These cattle are the smallest that come to Manila. They dress about 50 kilograms. The hide brings on an average ₱4.50 and the offal, ₱7. Buencamino states that these cattle also are kept under range conditions, so are wild; workmen in the abattoir are always cautious in handling them. They refuse to eat during the voyage, which is usually long, so the shrinkage is great. The meat of this class of cattle is about the same as that of the Dalupiri. They bring around ₱30 to ₱35 per head.

Palawan cattle: These animals are seldom seen in the Manila matadero. The average dressed weight is about 120 kilograms. The selling price of hide varies, the average being ₱8.80; the average of the offal is ₱12.60. The whole animal brings approximately ₱82.

Mindanao cattle: The appearance of animals from Mindanao indicates an infusion of Indian blood. This is shown by the presence of the hump. These animals are about the size of the Palawan cattle. The average dressed weight of five specimens was 111.4 kilograms. The hide brings ₱10.00 and the offal, ₱14.00. The animal as a whole brings on an average about ₱80.

Swine

The pork supply of the city of Manila comes from the surrounding provinces and districts. Hogs come chiefly from the provinces of Rizal, Cavite, Bulacan, Laguna, Pampanga, Nueva Ecija, and Pangasinan. This corroborates the findings of Noguera (1918). According to table 1, from 1919 to 1922 an annual average of 121,179 hogs were brought to the city of Manila. The number killed averaged 109,258. Ten pigs picked at random at the Manila matadero averaged 44.2 kilograms dressed weight, ranging from 28 to 75 kilograms.

Sheep and goats

More goats than sheep are killed in the Manila matadero. It is seldom that any of these animals are killed in the other slaughter houses. According to table 1, from 1919 to 1922 an annual average of 1,984 goats were brought to Manila.

There were many more sheep imported than were slaughtered in the city of Manila. The number varied from 127 in 1921 to 293 in 1922. The number slaughtered ranged from 29 in 1921 to 80 in 1919.

A large majority of the goats slaughtered are young, probably from one to three years old. Older goats are not popular for meat as they possess a characteristic objectionable odor, especially the males. The animals are generally of mongrel breeding and are small and variegated in color. Ten goats studied at the Manila matadero, dressed, on an average, 5.3 kilograms each, ranging from 3 to 7 kilograms. A hide sells from ₱0.40 to ₱1.00, depending upon the size. Goat meat is mostly consumed by the Hindu residents of Manila.

The writer did not see a sheep killed in the slaughter houses of Manila during his visits and so neither description nor dressed weight of this animal can be given. However, it is presumed that the sheep killed in the Manila slaughter houses are of the common stock, which is small and poor in conformation. The wool of this animal is of poor quality, being coarse and often mixed with black hairs.

Manner of purchasing and transporting animals

In the city of Manila, there are business corporations and individuals engaged in buying from abroad and from the different parts of the Islands animals for meat purposes. Of the firms importing animals from abroad, the following may be mentioned: Villanueva & Co., Lichauco & Co., and Soriano & Co. Messrs. J. Evangelista and A. N. José, in addition to importing cattle for meat purposes from foreign countries, buy animals in the Philippines. Among buyers of Philippine animals, Messrs. Marquez, Flameño, and Sempio may be mentioned.

G. S. Yuill & Co., Ltd. (Philippines Cold Stores), an Australian company, is engaged in bringing to this country refrigerated beef, mutton, and pork from Australia.

Cattle brought in by the different firms mentioned, whether from abroad or locally, are butchered in the slaughter houses of Manila by the purchasing firms, the carcass obtained therefrom being sold to different meat buyers. Refrigerated beef from abroad handled by Philippines Cold Stores is partly turned over to the Pacific Commercial Company, which in turn partly supplies the U. S. Army. The rest of this refrigerated beef is sold to the public. The U. S. Army also receives direct shipments of refrigerated beef from Tsingtao, China; this is stored in the refrigerators of the Government Ice Plant.

These different importing concerns have their agents in the foreign countries from which the Philippines receives meat supply. These agents do the buying and gathering together of these animals from abroad. They look after the immunization, quarantining, and other necessary requirements imposed by the countries of origin. Such importing firms charter special boats to transport the animals to Manila. These boats carry from 450 to 550 head each. Upon arrival in Manila the animals, if they come from Asiatic ports, are landed at the Pandacan Quarantine Station and, if from Australia, at the Sisiman stockyards in Bataan. There is a customs duty of four pesos per head on imported animals.

Native cattle are shipped to Manila by train or boat depending upon the place from which they come. On these animals entered in the abattoir a fee of ₱2 a head is charged for transfer of registration. If the animals have not been registered in the province before shipment to Manila a fee of ₱3 is charged for registration and transfer combined.

The hogs procured by different buyers are gathered in a central market place located on Calle Elcano, about half a kilometer from the Manila matadero. Here the hogs are sold to the different buyers, mostly Chinese, who in turn slaughter them and dispose of the carcass to retailers in the different Manila markets.

Hog buyers go out into the provinces around Manila and purchase hogs from the different producers. They contract usually, advancing one third of the price. These animals are left in the possession of the producer until a sufficient number has been accumulated to warrant shipment to Manila. The buyer pays for the feed consumed from the time the pig has been contracted for to the time it is delivered for shipment. Upon arrival at Manila, the hogs are carted to the market center on Calle Elcano. The Chinese buyers make their choice in the pens. The animals are then taken to the abattoir. The fee for transporting them from the pens to the Manila matadero is ten centavos a head. In the Manila Matadero the owners are charged ten centavos a head for the use of the slaughter house.

The few goats and sheep that are slaughtered in the Manila matadero come from within the city limits, or from neighboring towns. They are generally brought in and slaughtered by the persons who afterwards retail them in the markets. Ten centavos a head is paid for butchering goats in the slaughter house.

Pre-slaughter management

Imported cattle when suspected of any disease are kept under quarantine for a certain length of time, depending upon the nature of the disease. Cattle from French Indo-China, China, British India, and other Asiatic ports are slaughtered at the Pandacan slaughter house, so are sent to that place upon arrival in Manila, while Australian cattle are landed at the Sisiman Quarantine Station in the province of Bataan, where they are slaughtered. Native cattle coming from places that are suspected to be infected with a communicable disease are kept under quarantine in corrals owned by private individuals or corporations. These animals are given good feed so that they fatten during quarantine. Foreign cattle also gain in flesh while under quarantine. The feed given to these animals is usually imported alfalfa hay or rice gruel from broken and small grains.

All animals to be slaughtered, except goats, are fasted 24 hours before killing, Goats are given hardly any attention before killing.

Slaughter houses

The slaughter houses included in this survey are the Manila matadero. Pandacan slaughter house, and Sisiman slaughter house. These are the only abattoirs designated by the city of Manila for the slaughtering of animals for meat purposes. The City government rules:

> No person shall slaughter any four-footed animal for food or for sale, or cause or allow the same to be done, except in public slaughter houses: *Provided*, That suckling pigs and kids of not more than fifteen kilos weight and of an age prescribed by section eight hundred and ninety-four hereof may be slaughtered on private premises for personal use only, and not for sale.

The slaughter houses are generally the same in construction; they are open on all sides and the floor is either of stone or concrete. There is an ample supply of water for all purposes. Attached to the floor are rings to which cattle are tied before killing. The necessary overhead trolleys, hooks, and heating appliances are part of the equipment of the slaughter houses.

Method of slaughtering. Slaughtering includes killing, skinning, scraping, and cutting. The tools used are the common ones, such as meat saws, axes, steels, cleavers, and knives. In addition there is a special sticking knife called *matador* (Spanish word meaning *killer*). This is a heart-shaped tool used for pithing cattle. The blade is of steel, the guard of metal, and the handle of wood. The pointed edge is used in severing the medulla oblongata just behind the poll.

Cattle to be slaughtered are tied to the rings on the floor of the slaughter house. With a snappy swing of the hand the butcher thrusts the *matador* behind the occiput so that the point of the knife cuts the medulla oblongata between the axis and the atlas. Following this, the animal is bled. First, a longitudinal incision is made through the skin along the median ventral part of the neck, extending from the throat to a point just in front of the chest. A sort of a pocket is quickly made by loosening the skin on the lower side, after which the carotid arteries are severed. In this way, the blood accumulates in the fold of skin from which it is bailed into a container. The next step is to skin the animal. Beginning with the arms and thighs the operator makes an incision above and round the knees and hocks and cuts on the inside downward towards the ventral side

of the body. The shanks are then removed. The head is partly separated from the main body leaving but the skin to connect it. The body is then hung on a pulley by means of a rod attached to the flexor tendons of the hocks. After lifting the body, two hooks are attached to the flexor tendons to take the place of the rod. Skinning is then resumed. A cut is made at the middle of the chest and this is continued ventrally towards the anal opening, care being taken that the sexual organ is not cut, but instead a curve is made at this point so that the cut runs along one side of this organ. Skinning is again started on the ventral side and continued towards the dorsal side on each side. At the same time the tail is removed by partially cutting across the base and pulling it off from the body with the skin covering it. The next step is to cut through the flesh of the abdomen at the ventral side to expose the visceral organs. Then the head is completely removed. The abdominal cut is continued forward cutting the sternum at its middle thus exposing all the internal organs which are then removed. The internal organs together with the head, shank, tail, and blood form the offal. Inspection of the carcass then follows. By means of the meat ax and meat saw the carcass is partly divided longitudinally by cutting medially

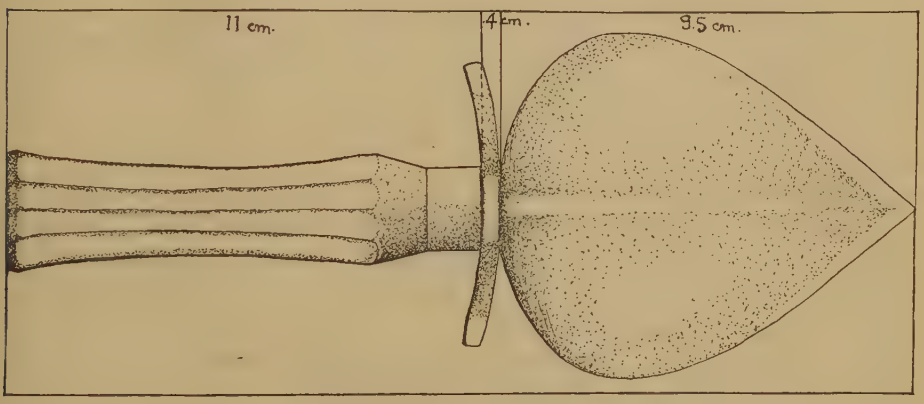

FIG. 1. Sticking knife called *matador*.

through the dorsal vertebrae until about the point of the shoulders. Another division is made by partly separating the fore quarter from the hind quarter between the twelfth and the thirteenth ribs. The cleaver and the butcher knife are used in this operation. There are then three points of attachment uniting the four parts or cuts of the animal. The cuts are then completely separated and are hung on hooks suspended from a bar operated by pulleys. The two cuts of the right side and of the left side are opposite each other. The order in which the cuts are hung in the slaughter house is as follows: right hind quarter, right fore quarter, left fore quarter, and left hind quarter or the reverse of the order mentioned. These are inspected and weighed separately and remain in the abattoir about one hour before they are taken away by the buyers.

A city of Manila ordinance, Section 894 (R. O.), states that it shall be unlawful to kill hogs less than eight weeks old. Previous to slaughtering, hogs are tied with all four feet drawn together. The animal is then washed thoroughly. With the hog on its side, the butcher thrusts the knife towards the heart at the middle of the neck. In this way the main arteries leading to the heart are cut

and bleeding ensues. The blood is collected and placed in cans. After bleeding the animal sufficiently it is dipped in a vat of hot water, heated by steam, for about 30 seconds. The temperature of the water varies from 75° to 80° C. The bristles are then scraped off with dull butcher knives. After this the skin is further shaved with sharp knives. An incision is then made, medially and ventrally, throughout the length of the body to expose the internal organs. The carcass and internal organs are then inspected. After inspection the internal organs are removed. If the animal passes inspection, it is hung up by inserting a hook through the suspensory ligament behind the ankle. Parts of animals that are condemned are stamped on the part condemned immediately after inspection, while such animals as are passed are stamped "passed" as soon as they are hung up. Carcasses condemned totally are so stamped all over the body. The owner pays ten centavos a pig to the butcher for killing and removing the internal organs and another ten centavos for scalding and cleaning.

Goats and sheep are not restrained before being butchered. The butcher holds the animal by the jaw and sticks the knife into the throat cutting it through across to sever all the structures in the region of the throat. Bleeding follows immediately and the animal dies quickly. The animals are then tied by the hind feet and hung up. Skinning follows, the method followed being the same as used with cattle. The head, entrails, and feet form the offal.

System of Inspection

The inspection work is carried on by experienced meat inspectors at the Manila matadero, the number of inspectors varying with the number of animals slaughtered. The chief inspector with six assistants is always present. Sometimes some inspectors from the Sisiman slaughter house are sent to the Manila matadero when there are many cattle to be slaughtered there and only a few in Sisiman. For imported animals at Pandacan and Sisiman a more rigid inspection, conducted by veterinarians, is maintained. In addition to the visual inspection blood smears are taken for microscopic examination.

Post-mortem examination of diseased animals. In conducting the inspection, besides the carcass, the internal organs, are examined. In the case of pigs the jowl is slit and examined for *Cysticerus cellulosae* which is indicated by the presence of minute sacs containing fluid. Such animals as are found to have this parasite in a more or less generalized form are condemned. The intestines are examined for intestinal parasites; the parts affected are condemned. The peritoneum is first examined for inflammation as indication of the presence of parasites. When an animal is discovered to be tubercular, only the diseased parts may be rejected, if the disease is localized, but in case of generalized tuberculosis the whole carcass is condemned. Any part of the carcass that is found to be bruised, congested, or inflamed is removed and condemned. The offal of the whole carcass is condemned, depending upon the nature and severity of the disease. Condemned animals or parts thereof are placed in a large cylindrical tin can and are carted to the city pound for cremation.

TABLE 4

Showing the number of parts of Philippine cattle carcasses condemned for different causes at the Manila matadero

CAUSES	1919	1920	1921	1922	TOTAL
Bruise	4	3	2	31	40
Congestion	2462	2105	2238	5395	12200
Inflammation	556	66	684	1372	2678
Abscess	13	12	1	1	27
Ulceration	—	—	—	60	60
Gangrene	—	—	—	35	35
Inflammation hemorrhagic	—	—	1	—	1
Emphysema	778	622	1015	2040	4455
Icterus	—	2	—	5	7
Cirrhosis	1	—	1	1	3
Atrophy	—	—	3	—	3
Enteritis, catarrhal	—	—	10	—	10
Parasitic infestation, external	954	646	1433	205	3238
Parasitic nodules	—	—	—	2060	2060
Nematode infestation	—	—	2	—	2
Distomatosis	516	467	610	1004	2597
Cysticercus bovis	—	—	5	—	5
Bronchopneumonia	43	22	28	12	105
Pleuropneumonia	—	—	—	2	2
Foot and mouth disease	—	16	—	75	91
Tuberculosis, local	97	40	136	277	550
Tuberculosis, mediastinal	3	13	101	—	117
Tuberculosis, general	—	(2)	(6)	(6)	(14)
Rinderpest	—	—	—	6	6
Immature foetus	624	741	587	1188	3140
Dying condition	—	(3)	—	—	(3)
Died in corral	(15)	(51)	(23)	(27)	(116)
Totals: Carcasses	(15)	(56)	(29)	(33)	(133)
Parts	6051	4755	6857	13769	31432

NOTE:—The numbers in parentheses indicate whole carcasses condemned.

TABLE 5

Showing the number of parts of Asiatic cattle carcasses condemned for different causes at the Pandacan slaughter house

CAUSES	1919	1920	1921	1922	TOTAL
Bruise	291	23	142	25	481
Congestion	6923	11112	39429	22997	80461
Inflammation	1834	(1) 1130	1024	577	(1) 4565
Abscess	6	3	—	—	9
Ulceration	1176	1875	2097	1992	7140
Gangrene	4	5	—	—	9
Emphysema	539	628	524	291	1982
Icterus	10	5	26	—	41
Cirrhosis	2	2	13	4	21
Pericarditis	4	6	14	—	24
Anaemia	60	309	969	698	2036
Atrophy	—	6	2	—	8
Purulent rhinitis	64	9	46	7	126
Gastritis, catarrhal	1876	1665	1353	—	4894
Enteritis, catarrhal	1467	1596	2413	—	5476
Proctitis, catarrhal	256	273	375	—	904
Nephritis, cystic	2	18	22	19	61
Tumors	3	4	2	2	11
Parasitic nodules	—	—	—	29	29
Nematode infestation	—	—	2	—	2
Distomatosis	1806	2771	4708	2389	11674
Cysticercus bovis	2	93	8	1	104
Bronchopneumonia	—	—	107	—	107
Foot and mouth disease	559	17574	2787	278	21198
Tuberculosis, local	489	370	794	760	2413
Tuberculosis, general	(1)	(3)	—	(12)	(16)
Rinderpest	—	—	81	—	81
Other causes	5	2	1	—	8
Totals: Carcasses	(1)	(4)	—	(12)	(17)
Parts	17378	39479	56939	30069	143865

NOTE:—The numbers in parentheses indicate whole carcasses condemned.

TABLE 6

Showing the number of parts of Australian cattle carcasses condemned for different causes at the Sisiman slaughter house

CAUSES	1921	1922	TOTAL
Bruise	46	79	125
Congestion	424	639	1063
Inflammation	812	8172	8984
Inflammation, suppurative	12	78	90
Myosis	—	22	22
Ulceration	152	6	158
Abscess	—	3	3
Necrosis, foot	1	2	3
Hemorrhagic septicemia	(1)	(3)	(4)
Emphysema	266	1950	2216
Icterus	1	—	1
Cirrhosis	6	9	15
Anemia	59	11	70
Atrophy	9	7	16
Gastritis, catarrhal	17	—	17
Parasitic nodules	17	297	314
Nematode infestation	27	—	27
Actinomycosis	—	4	4
Pleuropneumonia	54	149	203
Pneumonia, gangrenous	(1)	—	(1)
Tuberculosis, local	151	821	972
Tuberculosis, general	(4)	(29)	(33)
Died in corral	(6)	(42)	(48)
Totals: Carcasses	(12)	(74)	(86)
Parts	2054	12249	4303

NOTE:—The numbers in parentheses indicate whole carcasses condemned.

TABLE 7

Showing the number of parts of swine carcasses condemned for different causes at the Manila Matadero

CAUSES	1919	1920	1921	1922	TOTAL
Bruise	1	2	27	5	35
Congestion	66	103	693	74432	75294
Hypostatic congestion	31364	23340	34195	9905	98804
Inflammation	6809	1257	30284	31111	69461
Ulceration	—	—	—	—	—
Abscess	20	30	11	30	91
Gangrene	—	—	—	—	—
Inflammation, hemorrhagic	—	—	—	—	—
Septicemia	(1)	(1)	(2)	(9)	(13)
Emphysema	—	14	—	7	21
Icterus	(1) 3	(4) 6	(13) 59	(6) 373	(24) 441
Cirrhosis	238	38	2144	8091	10511
Emaciation	—	—	—	(7)	(7)
Parasitic infestation, external	1228	1828	767	534	4357
Parasitic nodules	—	—	—	20	20
Nematode infestation	112	279	816	1128	2335
Distomatosis	—	27	—	—	27
Cysticercus cellulosae	(1481)	(1123)	(772)	(1249)	(4625)
Bronchopneumonia	—	4	—	—	4
Tuberculosis, local	96	201	454	244	995
Tuberculosis, general	(7)	(19)	(31)	(32)	(89)
Hog cholera	(27)	(37)	(37) 816	(37) 2	(138) 818
Immature foetus	817	1133	2705	2911	7566
Dying conditon	—	—	—	—	—
Died in corral	(3)	(15)	(23)	(18)	(59)
Totals: Carcasses	(1520)	(1199)	(878)	(1358)	(4955)
Parts	40754	28262	72971	128793	270780

NOTE:—The numbers in parentheses indicate whole carcasses condemned.

TABLE 8

Showing the number of parts of goat and sheep carcasses condemned for different causes at the Manila matadero

CAUSES	1919		1920		1921		1922		TOTAL	
	Goat	Sheep	Goat	Sheep	Goat	Sheep	Goat	Sheep	Goat	Sheep
Bruise	—	1	—	—	—	—	—	—	—	1
Congestion	258	11	706	34	2381	18	2617	92	5962	155
Congestion hypostatic	370	12	—	—	—	—	—	—	370	12
Inflammation	4	—	8	—	160	2	703	10	875	12
Septicemia	340	12	5	—	—	—	—	—	345	12
Emphysema	—	—	—	—	—	—	615	36	615	36
Icterus	—	—	—	—	—	—	12	—	12	—
Cirrhosis	8	—	—	—	—	—	57	—	65	—
Parasitic infestation, external	334	17	5	—	1270	11	—	—	1609	28
Nematode infestation	—	—	933	29	379	6	1426	36	2738	71
Distomatosis	105	—	76	6	51	1	57	—	289	7
Foetus, immature	182	20	128	6	319	1	203	—	832	27
Totals	1601	73	1861	75	4560	39	5690	174	13712	361

TABLE 9

Showing the number of parts of Australian goat carcasses condemned for different causes at the Sisiman slaughter house

CAUSES	1922
Inflammation	73
Parasitic nodules	53
Cirrhosis	4
Immature foetus	5
Total	135

Distribution of meat

After slaughtering, cuts which have been passed by the meat inspector are distributed among the different buyers. Before delivery the parts are weighed and labeled. Labeling is done by tying to each part a tag on which the name of the addressee, the place of destination, and the weight of the cut are given. The meat is delivered to the Manila markets by a meat wagon owned by the city of Manila. However, if the buyer wishes, the meat may be taken from the matadero by other kinds of transportation. The delivery charges in the city wagon to any of the Manila markets is 40 centavos per dressed animal.

The meat from the Pandacan slaughter house is taken across the Pasig River either in a *banca* or a *casco*, the usual charge being ten centavos per quarter of carcass. From the *banca* or *casco* the meat is taken in carretelas to the Manila markets. The cost of this transportation varies.

The meat from the Sisiman slaughter house is taken to Manila on steamboats owned or chartered by the importer. At the Manila wharfs the different buyers receive the meat and pay the cost of transporting it to the markets.

Most of the wholesale cuts are delivered to Divisoria, Quinta, Arranque, Paco, Sampaloc, Tondo, and Obreros markets; but a large percentage goes to hotels, restaurants, dormitories, and hospitals.

TABLE 10

Showing the number of retail dealers of meat in the Manila markets[a]

MARKETS	BEEF		PORK	
	Filipino	Chinese	Filipino	Chinese
Divisoria	59	0	4	51
Quinta	44	0	2	29
Arranque	25	0	2	19
Paco	13	0	2	9
Sampaloc	13	0	0	15
Obreros	10	0	0	11
Santa Ana	6	0	0	7
San Andrés	5	0	0	4
Tondo	11	0	4	10
Pandacan	3	0	0	0
Gagalañgin	1	0	0	0
Sta. Mesa	2	0	0	0
Total	192	0	14	155

[a] From a letter to the author from the Division of City Markets, Manila. April, 1923.

Retailing

The retail business in meat is in the hands of both Filipinos and Chinese. As may be seen in table 10, out of 192 retailers of beef in the different markets of Manila none are Chinese, while of the 169 pork retailers, 155 are Chinese and 14 are Filipinos. The reason for this is probably that the Chinese are more thrifty as merchants and can live on a smaller margin than the Filipinos. The handling of a hog carcass apparently requires more labor in proportion to its size and returns than that of an ox.

Meat retailed in the different markets of Manila is sold by the kilogram at different stalls. Pork and beef are usually cut by the retailer into pieces weighing from one to three kilograms ready to be sold. The price of pork, beef, and goat meat, is usually fairly steady. Fluctuations do occur, however, depend-

ing upon the general law of supply and demand and upon the kind of meat sold. Meat is usually cheaper in the afternoon than in the morning. The presence of bone in the meat has also a great deal to do with the price. Any unsold meat is put into the retailer's iceboxes. Some retailers make use of their unsold pork by turning it into sausage and salted pork, while some retailers convert their unsold beef and pork into dried salted meat, or *tapa*. These secondary products are sold in the markets.

For making sausage the following recipes are used:

The small intestines of pigs are used as sausage casings. The casings are prepared by thoroughly cleaning the intestines, then drying and inflating them. Such prepared casings may be secured in the Divisoria, Arranque, Quinta, and Paco markets. Into these casings the following mixtures are put. Every ten centimeters the casing is tied tightly thus making sausages of equal convenient length.

Mixture No. 1:

For every five kilograms of ground pork add:

200 cc. Chinese sauce (soy)
1 teaspoonful of potassium nitrate
1 teaspoonful of common salt
25 drops of lemon juice

The mixture is kept in a receptacle to cure for two or three days before putting it into the casing.

Mixture No. 2:

To every five kilograms of sliced pork add:

500 cc. common vinegar
3–5 heads of garlic
Salt to taste

In some cases black pepper and *achuete* or anatto (*Bixa orellana*) are put in to color and season the meat. The whole mixture is put through a grinding machine before putting it into the casing.

Goat meat, or chevron, is sold only at the Quinta market. This is probably because many Hindus who are the largest consumers of this meat, live in this vicinity. This meat is sold by the kilogram.

Disposal of hide and offal

The hides of cattle and goats are bought by tanners at the slaughter houses. The entrails, head, tail, and shanks are handled by a separate class of retailers who take these parts to the markets and sell them as such. The entrails are, of course, first cleaned before they are sold. These are sold by the size and general appearance and not by any unit of weight.

SUMMARY

1. The kinds of animals other than poultry slaughtered to supply meat for the city of Manila are: cattle, hogs, goats, and sheep.

2. Beef cattle that are slaughtered include imported and native stock. During the years from 1919 to 1922, more of these animals came from foreign countries than from the Islands. The principal source of foreign animals was Pnom-Penh (French Indo-China). Other foreign sources are Hongkong, Tsingtao, Annam, and Australia. A few were received from Siam and Saigon.

3. From the Philippines, beef cattle are obtained from Batangas, Tayabas, Rizal, Ilocos provinces in Luzon Island, Capiz, Leyte, Davao, Cotabato, Bukidnon, Jolo in the southern part of the Archipelago, and Mindoro, Palawan, Marinduque, Burias, Tablas, Masbate, Dalupiri, Fuga, and Babuyan islands.

4. The refrigerated meat supply of Manila comes principally from Australia and is handled by G. S. Yuill & Co. Ltd. (The Philippines Cold Stores). The U. S. Army imports refrigerated meat from China.

5. From the carcass of cattle, three main products are obtained; the dressed carcass, the hide, and the offal.

6. In the dressed carcass there is a constant difference of ten centavos per kilogram in the wholesale price between the fore and the hind quarter in favor of the hind quarter.

7. The hogs butchered in the city of Manila are obtained from near by provinces. The great majority of them are native hogs.

8. Goats and sheep that are slaughtered to supply goat meat and mutton for the city of Manila are generally of the common stock obtained in the vicinity of the city.

9. There are various corporations and individuals engaged solely in importing and buying locally meat animals to supply the Manila markets with meat. Animals brought from foreign countries are usually loaded on boats chartered by the importer. Individual buyers purchasing animals from the provinces follow the old system of individual purchases. The animals are shipped to Manila on the hoof either by train or by boat.

10. The present regulations of the city of Manila require that all animals be slaughtered at the Manila matadero, Pandacan, or Sisiman slaughter houses.

11. Excepting sheep and goats, animals to be slaughtered are fasted 24 hours previous to butchering.

12. The tools used in butchering are adequate and durable.

13. The methods of killing, skinning, scraping, and cutting meat animals in the slaughter houses are efficient, for hand equipment.

14. The system of inspection followed in the slaughter houses in Manila and Sisiman is adequate.

15. The disease and defects causing the rejection of carcasses or parts thereof are many.

16. The meat from the different slaughter houses is distributed to the different Manila markets, hotels, restaurants, dormitories, and other places. In the Manila markets the meat is retailed.

17. Beef dealers are all Filipinos while pork dealers are mostly Chinese.

18. The hides, entrails, shanks, and tails are all disposed of at stated prices. The hide goes to tanners and the entrails are sold by retailers handling these materials alone.

19. Unsold meat is either placed in iceboxes for future sale or made into dried salted beef or *tapa*, salted pork, or sausage.

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A STUDY OF THE FLOWERING HABITS AND FLOWER CHARACTERISTICS OF DIFFERENT VARIETIES OF SUGAR CANE[1]

SERGIO B. PAGLINAWAN

In successful hybridization work in sugar cane, a knowledge of the flowering habits and flower characteristics of the different varieties to be used, and even of those not directly involved in the experiments, is of great value. The present investigation deals with some facts concerning the flowering habits and flower characteristics of different varieties of sugar cane under culture on the College Farm.

The purpose of the work was two-fold: First, to obtain some data concerning the flowering habits of different varieties of sugar cane under culture in this College; and second, to study the cane flower and its characteristics. The work was carried out under the Division of Plant Breeding, Department of Agronomy, College of Agriculture, during the flowering season of 1922-23.

MATERIAL

The varieties of sugar cane used in this investigation consisted mostly of ratoon and plant canes all under culture in different places on the College Farm.

EXPERIMENTS AND RESULTS

Nature and behavior of the flower

The nature and behavior of the flower were carefully noted. A number of arrows from different varieties were used.

It was found that the flowers bloomed more frequently in the morning from six to eight o'clock, than in any other part of the day. Generally, the anthers began to open at six in the morning and dehiscence occurred as soon as they were dry. Dehiscence did not occur while the anthers were wet with rain or dew. On rainy and cloudy mornings the opening of the anthers was retarded. Hard continuous rains prevented their opening. It was also noted that the stamens in an arrow did not all open in one day. A certain number dehisced every day for about three successive days. In all cases, it was observed that the stamens from the upper portion of the arrow were always the first to dehisce. It was observed that as soon as the anthers burst, pollen grains were seen falling on the stigmas. This fact was noted both in the bagged and unbagged flowers of many plants. In most cases the stigmas became receptive from the third to the tenth day. This was easily determined, as from the third to the tenth day after the appearance of the arrow, numerous pollen grains were seen on the minute stigmas. After the tenth day, the stigmas became dry and shriveled. The shriveling of the stigmas may indicate that pollination has already taken place.

[1] Thesis presented for graduation (1923) with the degree of Bachelor of Agriculture from the College of Agriculture, No. 201; Experiment Station contribution No. 298. Prepared in the Department of Agronomy under the direction of Dr. Nemesio B. Mendiola.

It was also noted that the seeds from the tip of the arrow ripened earlier than those from any other portion. This was indicated by their being the first to fall off when the plant was shaken.

The pollen. The measurement of pollen grains from several varieties showed that they varied in size from 15 to 65 μ. There was variability in size, even in pollen grains from the same arrow. After exposure to the open air for some time they became shriveled, the degree of shriveling being, of course, dependent upon the temperature, wind, and other factors. When immersed in water, however, they quickly resumed their former shape. The apparently fertile pollen grains, those containing granules, were almost round in shape. Such pollen was found to germinate after a few minutes on the viscous stigmas of Connecticut Havana tobacco but on no other medium used.

The abortive pollen grains were found to be smaller and not usually as round as the fertile ones. Not infrequently, well shaped pollen grains without granular matter inside were seen. In no instance did such pollen grains germinate.

Insects found to frequent the sugar cane flowers. The insects[2] which were found to frequent the sugar cane flowers were carefully noted and examined for pollen grains attached to their bodies. It was suspected that these insects were probable agents in pollination.

Relative date and age of flowering

Observation was made on the exact flowering time of each variety. In this connection, the appearance of the first arrow or arrows was noted and the date recorded. The age was computed to represent, in the case of plant cane, the length of time from planting, and in the case of ratoon cane, from the time the field was cut to ratoon, up to the "shooting"[3] of the first inflorescence.

Results. The flowering season on the College Farm began September 15, 1922, and ended December 5, 1922. Chinois and Uba continued flowering up to about the beginning of February. The first two varieties to flower were P. B. 113 and P. B. 116, both of the forage type of canes. The last two varieties to flower were Big Tanna, a large cane, and Uba, which belongs to the forage class. The flowering time of the different varieties studied is given in table 1.

Pollen supply

Some 44 different varieties were examined for pollen supply. In determining the amount of pollen supply the writer went to the field early in the morning, usually before pollination had taken place so as to prevent loss of pollen; when the anthers began to dehisce he put an arrow into a paper bag and then cut it out from the stalk. The arrow was taken to the laboratory, removed from the paper bag, and shaken into a glass vessel. The bag was opened for pollen grains that might have adhered to the sides. By this process several arrows from different varieties could be examined in one morning. In this connection, the condition of the anthers was noted to see if the observation of Barber (1920) that opened anthers appeared to be connected with the presence of fertile pollen, holds true with the canes on the College Farm. The color of the anthers, as suggested by Doctor Mendiola, was also noted to see if color of anther had any relation with the supply of pollen. In many cases, the results were checked by bagging sep-

[2] The insects were identified by the Department of Entomology.

[3] "Shooting" refers to the appearance of the arrow.

arately a few arrows of each variety with paraffined paper and then noting the amount of coloration on the sides as affected by the amount of pollen which fell into the bag. In an arrow well supplied with pollen a great number of pollen grains fall into the bag giving it a distinct yellowish coloration at the sides. It should be remarked at this point that the main purpose of bagging arrows from different varieties was to determine the ability of each variety to produce self-fertile seeds.

Results. Of the 44 different varieties examined, 30 varieties were found to be well supplied with pollen; six; namely, P. B. 7, P. B. 103, Mauritius Malagache, Negros Purple, Badila and Formosa, were poorly supplied and eight were not supplied with pollen at all. These eight were P. B. 104, P. B. 8, P. B. 105, P. B. 2, Chinois, Big Tanna, Natal Uba and C. A. 16402. All those which were found to be well supplied had open anthers. The color of the anthers was found to be not necessarily connected with pollen supply, as the varieties Chinois, Uba, P. B. 105, P. B. 2, and C. A. 16402, all of which were not supplied at all with pollen, had purplish anthers like those of the varieties which were found to have abundant pollen supply.

Length of time from shooting to pollination and to ripening of seeds[4]

The length of time from shooting to pollination and from shooting to the ripening of seeds was determined. A number of individual stalks was used for this purpose. That pollination was taking place or had just taken place, could easily be recognized because of the numerous pollen grains which could be seen on the stigmas. Shortly after pollination the stigmas dried and shriveled. The plants from each variety were numbered consecutively and the date of appearance of the arrow was noted and recorded. In determining the length of time before the seed ripened, the same plants used in determining time from shooting to pollination were utilized. Vigorous and healthy plants and those free from disease were always preferred.

Results. The results are shown in table 2. In the varieties P. B. 113, P. B. 114, P. B. 116, and C. A. 12797F_2 the length of time from shooting to pollination was from 3 to 5 days, only. In the other varieties it ranged from 7 to 12 days. In most varieties pollination occurred from 7 to 10 days after the appearance of the arrow.

Seeds became ripe in from 17 to 31 days after shooting. Seeds from P. B. 113 and P. B. 116 ripened the earliest.

Vitality test of pollen grains

The first medium used in germinating the pollen grains was sugar solution, a medium ordinarily used for this purpose. Solutions ranging from 2 to 40 per cent concentration were used, prepared fresh every day the germination was made. When numerous tests had been made without success, sugar solutions plus agar-agar in varying proportions were used, but with no better results. Having failed to germinate pollen in these media, the writer resorted to the use of stigmas of plants available on the Campus at that time. Stigmas of Connec-

[4]The term "seeds" as here used refers to the fruits since no examination of the seeds proper was made.

ticut Havana tobacco were used with success but only a few varieties of sugar cane were thus tested because when these stigmas were available most of the more promising cane varieties had passed their flowering time. Stigmas of other plants, *Bauhinia malabarica*, *B. purpurea*, *Solanum grandiflorum*, and *Hibiscus rosa-sinensis* were tried but without success.

Before dusting pollen on the stigma it was examined under the microscope for pollen already there. In most cases, flowers were emasculated in the afternoon and gathered very early the following morning. In some cases, flowers which were not yet pollinated were emasculated and gathered in the afternoon for use the following morning. They were kept in a small vessel containing water.

The pollen from a variety was collected very early in the morning and placed in germination test immediately. The arrow was shaken into a clean dry glass vessel and kept under another larger vessel within which was a third very small vessel containing water to keep the inside moist and cool. It was observed after a short time that without this moisture, pollen deteriorated quickly. Another arrow was kept in the same way but with the male organs, which were still unopen, in it. It was observed that the anthers continued to open for some time under this condition.

Results. The viscous stigmas of Connecticut Havana tobacco were found to be a satisfactory medium for germination. A little over 20 per cent germination was secured. The length of the pollen tubes ranged from 20 to 160μ.

The number of days pollen grains remain viable was also determined. The results are given in table 3. After 24 hours it was found that only one or two out of several hundreds of pollen grains germinated. The percentage of germination in this case was not recorded. Pollen grains from the stamens allowed to remain in the arrow and kept under the same condition met with no better success. This percentage of germination was not recorded.

Self-fertility of different varieties

An attempt to determine the ability of different varieties to produce self-fertile seeds was made. This was done by bagging separately several arrows from each variety. To be sure that no foreign pollen could possibly fertilize the stigmas of the bagged plants the bagging was done soon after the arrow appeared. These plants were visited as often as necessary so as to collect the seeds just as soon as they ripened. One seed box was planted to seeds from each variety. No counting of seeds was done.

Results. Of the 21 varieties from which the writer was able to collect fuzz, eight produced fertile seeds, and thirteen did not. However, four varieties in which the self-fertilized fuzz did not germinate, namely, P. B. 8, P. B. 105, P. B. 2, and C. A. 14806, were found not to be supplied with pollen, so that the failure of the seeds from these four varieties to germinate can be attributed to this. In some varieties no seeds were collected because the bagged arrows were either broken or did not come to maturity. In table 4 is the complete list of the varieties which produced self-fertilized seeds and those which did not.

Comparative vitality and viability of sugar cane seeds

Ripe seeds from different varieties were collected and put in paper bags. To insure purity, the seeds were collected as soon as they began to fall upon shaking the arrow. The bags were closed by binding each of them with a piece of string

and under this condition they were kept in the laboratory. Since the fertility of the seeds from the different parts of the arrow was determined, in collecting, the upper third of the arrow was first carefully cut, then the middle third, and finally the lowest third. After each cutting the cut portion was put in a separate bag. Thus, for each variety three bags were needed. As many arrows as possible from each variety were collected. In this part of the work great care was taken to prevent mixture of seeds from the different parts of the arrow. Each variety was handled separately. The date the seeds were collected was recorded.

That the comparative vitality of the seeds in exact percentage could be expressed, 1000 seeds from the tip, from the middle, and from the base portions of the arrows were counted. In counting, to prevent mixtures, the seeds from each portion were counted separately and with extreme care. After each counting the counted seeds were put in small seed envelopes which were sealed at once. Each envelope was properly labeled. Seeds from the different portions but from the same variety were germinated in one seed box, the seeds from the different portions being separated. To do this, each seed box was divided into three equal portions by means of bamboo sticks long and wide enough to prevent any possibility of intermixing of seeds in the same seed box.

Seeds from each variety were germinated at intervals of 30 days to determine how long they would remain viable. The same number of seeds were germinated in this experiment.

The method of germination followed is that described by Mendiola (1921) and practiced in this College.

Results. Table 5 contains the results obtained in this experiment. Going over table 5 carefully, it may be seen that the period from the time the seed was collected to the time of the first planting is not uniform throughout. Owing to lack of seed boxes, seeds of some varieties had to be kept for a longer period than others in the laboratory. In interpreting the results this point should be taken into account.

In the first planting, P. B. 83, a forage cane, gave the highest percentage of germination with an average of 26.3. This means that for every thousand seeds, 263 germinated. In the case of Louisiana Striped, P. B. 8, and P. B. 105 only one seed each out of every 3,000 seeds planted grew. It should be noted that P. B. 8 and P. B. 105 have been mentioned as being unsupplied with fertile pollen. Of the larger type of canes, C. A. 13109 gave the highest percentage of germination, the average being 23.6 per cent. It may also be seen in this table that generally the seeds from the central portion of the arrow gave the highest percentage of germination, both in the first and second plantings. The percentage of germination in the first planting ranged from as low as 0.03 to as high as 26.3. A marked decrease in germination can also be seen. Seeds remained viable from 35 to a little over 70 days, depending largely on the variety. Seeds from P. B. 116 planted 90 days after the first planting did not germinate.

DISCUSSION OF RESULTS

Relative date and age of flowering of different varieties on the College Farm

Referring to table 1, it may be seen that although two or more varieties flowered on the same date, in the majority of cases, the flowering time was dif-

ferent. The flowering season was from September 15 to December 5, a period covering approximately 76 days, or a little over two and one-half months. It is worthy of note that the first two and the last one of the two varieties to flower were all of the forage type of canes. Thus, it appears, from the results here obtained, that the flowering time may largely depend on the variety rather than on the type—whether forage type or large type. This result does not agree with that obtained in India as reported by Barber (1920) which showed that as a class the thick canes flowered earlier than the thin.

The age at which the canes on the College Farm began to arrow ranged from about 327 to 419 days from the exact date of planting. In case of ratoon canes the period was counted from the time of cutting of the parent field. Of the forage canes, the varieties P. B. 113 and P. B. 116, the first two to flower, were only about 7 to 8 months old at the time of arrowing.

Pollen supply

The results obtained in the examination for pollen supply of most of the varieties which arrowed, show that not all the varieties of sugar cane in the College which were used in this experiment were supplied with fertile pollen.

The observation of Barber (1920) that open anthers were connected with the supply of fertile pollen was found to hold true with the canes on the College Farm that were examined. The color of anther was found to be not necessarily correlated with pollen supply.

Length of time from shooting to pollination and to ripening of seeds

Length of time from shooting to pollination. It may be seen from table 2 that the length of time from shooting to pollination varies with different varieties ranging from as early as three days to as long as twelve. In the varieties P. B. 113 and P. B. 116, pollination occurred the earliest. Pollination in the two varieties which are both of the forage type of canes occurred on the third day of the appearance of the arrow. In the other canes belonging to the same type; namely, P. B. 114 and C. A. 12797F_2, pollination occurred on the fourth day of the appearance of the arrow with P. B. 114 and on the fifth day with C. A. 12797F_2. In the remaining five varieties of canes belonging to the same class, P. B. 7, P. B. 83, Mauritius Malagache, P. B. 111, and P. B. 7A, pollination occurred on the eighth day. The rest of the varieties all belong to the larger type of canes and in these, pollination occurred from the seventh to the tenth day after the date of shooting in the majority of cases.

Length of time from shooting to ripening of seeds. In table 2, it may also be seen that the length of time from shooting to the ripening of the seed varies in different varieties. The seed ripened in from 17 to 31 days. Excepting Mauritius Malagache, it was found that the seed from the forage type of canes used in this part of the work ripened in a comparatively short period of time. Seeds from these varieties ripened from 17 to 23 days after the shooting of the flower. In the larger type of canes, seeds ripened from 23 to 31 days after the appearance of the arrow.

Germination of pollen

Vitality of pollen. Although the results given in table 3 are confined to five different varieties, four of which belong to the forage type, it may be sufficient to show that the percentage of pollen vitality varies with the variety. The variety C. A. 12797F_2, a seedling cane, and of the large forage type, gave the highest percentage of germination, while variety P. B. 62, a larger type, gave the lowest, only 11.53 per cent.

Concerning the different media used, the viscous stigmas of Connecticut Havana tobacco gave the best results, the other two media employed and the stigmas of the other plants met with no success.

Viability of pollen. In table 3, it may be noted that the pollen grains maintained their viability for seven hours, although at the seventh hour there was a marked decrease in viability. This shows that under the condition in which the pollen grains in this study were kept, sugar cane pollen may retain its viability for several hours.

Self-fertility in sugar cane seeds. The results obtained in this part of the work are given under the topic, "Comparative Vitality and Viability of Sugar Cane Seeds". Self-fertilized seeds from eight different varieties germinated, hence, these varieties are self-fertile. Those from the other nine varieties (disregarding the four varieties which were found not to be supplied with pollen) did not germinate. It cannot be definitely concluded at present whether the varieties in which the self-fertilized seeds did not germinate are self-fertile.

Germination of sugar cane seeds

The results obtained in this experiment show that seeds from the different varieties of sugar cane used, differ both in vitality and viability. Under the conditions in which the seeds were kept, the viability lasted from 35 to a little over 70 days after the seed was collected. The results also point out the fact that generally the seeds from the middle portion of the arrow gave a higher percentage of germination than those from either the tip or the base. Again, the results also support the conclusion that from a single arrow it is possible to raise nearly 1000 seedlings.

SUMMARY OF CONCLUSIONS

From the results of the experiments reported in this paper, the following conclusions may be drawn:

1. The blooming of the cane flowers was much more frequent from six to eight o'clock in the morning than in any other part of the day. The anthers began to dehisce at six o'clock in the morning. Only a certain number of stamens opened every day. In an arrow the opening of the anthers usually continued for three successive days.

2. Although the sugar cane flower is, because of its structure, largely wind pollinated, it may also be subject to insect pollination to a slight extent.

3. The flowering season of the different varieties of sugar cane found on the College Farm and which were used in this experiment began September 15 and ended about December 5, a period covering approximately 80 days. The different varieties used varied in their time of flowering, and the age at which they began to flower is also variable, ranging from 255 to 411 days.

4. The length of time from shooting to pollination and from shooting to the ripening of the seed was variable.

5. The different varieties examined for pollen supply varied in this respect. Open anthers appeared to be correlated with the supply of fertile pollen while color was not necessarily connected with it.

6. The pollen grains of sugar cane germinated on the viscous stigmas of Connecticut Havana tobacco. Viability lasts for about seven hours under the conditions under which they were kept in this work.

7. While it is not safe to definitely conclude that the varieties in which the self-fertilized seeds did not germinate are self-fertile, it is safe enough to conclude that the other varieties in which the self-fertilized seeds grew, are self-fertile.

8. Seeds of sugar cane differ in vitality as well as in viability.

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TABLE 1

Relative date and age of flowering of different sugar cane varieties on the College Farm

NO.	COLLEGE NUMBER OR VARIETY NAME	DATE PLANTED OR RATOONED		DATE OF FLOWERING	AGE
		Planted	Cut to ratoon		
		1921	1921	1922	*days*
1	P. B. 113	———	———	Sept. 15	———
2	P. B. 116	———	———	Sept. 20	———
3	P. B. 104 or C. A. 14806	Sept. 29		Oct. 19	385
4	P. B. 8	Oct. 5		Oct. 23	383
5	P. B. 7	Oct. 5		Oct. 23	383
6	P. B. 24	Oct. 6		Oct. 23	383
7	P. B. 91	Sept. 29		Oct. 23	389
8	H–309		last week of Nov.	Oct. 23	327–332
9	H–69		last week of Nov.	Oct. 23	327–332
10	P. B. 115			Oct. 23	———
11	C. A. 12681	Sept. 29		Oct. 25	391
12	P. B. 68	Sept. 29		Oct. 25	391
13	P. B. 40	Sept. 29		Oct. 25	391
14	P. B. 77A	Sept. 29		Oct. 26	392
15	H–20		last week of Nov.	Oct. 27	331–336
16	P. B. 89	Sept. 29		Oct. 28	394
17	Mauritius Malagache		last week of Nov.	Oct. 28	332-337
18	P. B. 103	Sept. 29		Oct. 28	394
19	Negros Purple		last week of Nov.	Oct. 29	333–338
20	C. A. 16402	Sept. 29		Oct. 30	396
21	P. B. 83	Sept. 29		Oct. 30	396
22	P. B. 42	Sept. 29		Oct. 30	396
23	P. B. 7A	Oct. 5		Oct. 30	390
24	C. A. 12341 Louisiana Striped		last week of Nov.	Oct. 31	335–340
25	H–227		last week of Nov.	Oct. 31	335–340
26	P. B. 111			Oct. 31	———
27	P. B. 105	Sept. 29		Nov. 1	398
28	P. B. 15	Oct. 5		Nov. 3	394
29	P. B. 114			Nov. 4	———
30	Demerara 1135		last week of Nov.	Nov. 4	339–344
31	Java 247		last week of Nov.	Nov. 5	340–345
32	P. B. 106			Nov. 5	———
33	Guro or New Guinea 24		last week of Nov.	Nov. 6	341–346
34	Formosa		last week of Nov.	Nov. 7	342–347
35	C. A. 12797F_1	Feb. 25		Nov. 7	255
36	C. A. 12797F_2	trans-planted Feb. 25 1921		Nov. 7	255
37	P. B. 75	Sept. 29		Nov. 7	404
38	P. B. 62	Oct. 5		Nov. 7	398
39	C. A. 16308	Sept. 29		Nov. 9	406
40	P. B. 31	Oct. 5		Nov. 9	400
41	P. B. 2	Oct. 5		Nov. 9	400
42	P. B. 6	Oct. 5		———	———
43	P. B. 85 or C. A. C. 87	Sept. 29		Nov. 9	406
44	Mindoro		last week of Nov.	Nov. 9	344–349
45	P. B. 108			Nov. 10	———
46	P. B. 109			Nov. 10	———
47	P. B. 107			Nov. 11	———
48	P. B. 110			Nov. 11	———
49	P. B. 98	Sept. 29		Nov. 11	408
50	P. B. 81	Sept. 29		Nov. 12	409
51	C. A. 13109	Sept. 29		Nov. 14	411
52	P. B. 112			Nov. 15	———
53	Chinois		last week of Nov.	Nov. 17	352–357
54	H–27		last week of Nov.	Nov. 20	355–360
55	P. B. 19	Oct. 5		Nov. 20	411
56	C. A. 14810	Sept. 29		Nov. 22	419
57	H–16		last week of Nov.	Nov. 23	358–363
58	Badila		last week of Nov.	Nov. 24	359–364
59	New Guinea 24b		last week of Nov.	Nov. ..	———
60	P. B. 57	Sept. 29		Nov. ..	———
61	Hambledon 426		last week of Nov.	Nov. ..	———
62	P. B. 61	Sept. 29		Nov. ..	———
63	Big Tanna			Nov. 24	———
64	Natal Uba		last week of Nov.	Dec. 5	370–375

TABLE 2

Length of time from shooting to pollination and to ripening of seeds

NO.	COLLEGE NUMBER OR VARIETY NAME	NO. OF PLANT	DATE OF APPEARANCE OF ARROW	DATE READY FOR POLLINATION	NO. OF DAYS	DATE SEEDS RIPENED	NO. OF DAYS
			1922	1922		1922	
1	P. B. 113	1	Sept. 18	Sept. 21	3	Oct. 5	17
		2	Sept. 18	Sept. 21	3	Oct. 6	18
		3	Sept. 18	Sept. 21	3	Oct. 6	18
2	P. B. 116	1	Oct. 8	Oct. 11	3	Oct. 25	17
		2	Oct. 8	Oct. 11	3	Oct. 25	17
		3	Oct. 8	Oct. 11	3	Oct. 25	17
3	P. B. 104 or C. A. 14806	1	Oct. 20	———	—	Nov. 12	23
		2	Oct. 20	———	—	Nov. 12	23
		3	Oct. 20	———	—	Nov. 12	23
4	P. B. 8	1	Oct. 23	———	—	Nov. 17	25
		2	Oct. 23	———	—	Nov. 17	25
		3	Oct. 24	———	—	Nov. 17	24
5	P. B. 7	1	Oct. 23	Oct. 31	8	Nov. 15	23
		2	Oct. 24	Nov. 1	8	Nov. 16	23
		3	Oct. 24	Nov. 1	8	Nov. 16	23
6	P. B. 24	1	Oct. 23	Nov. 2	10	Nov. 23	31
		2	Oct. 23	Nov. 2	10	Nov. 23	31
		3	Oct. 24	Nov. 3	10	Nov. 23	30
7	P. B. 91	1	Oct. 22	Nov. 1	10	Nov. 22	31
		2	Oct. 22	Nov. 2	11	Nov. 22	31
		3	Oct. 23	Nov. 2	10	Nov. 22	30
8	P. B. 103	1	Oct. 28	Nov. 5	8	Nov. 22	25
		2	Oct. 28	Nov. 5	8	Nov. 22	25
		3	Oct. 28	Nov. 5	8	———	—
9	C. A. 12681	1	Oct. 25	Nov. 3	9	Nov. 20	26
		2	Oct. 27	Nov. 5	9	Nov. 22	26
		3	Oct. 28	Nov. 6	9	Nov. 23	26
10	P. B. 68	1	Oct. 25	Nov. 3	9	Nov. 25	31
		2	Oct. 25	Nov. 3	9	Nov. 25	31
		3	Oct. 25	Nov. 3	9	Nov. 25	31
11	P. B. 83	1	Oct. 30	Nov. 7	8	Nov. 21	22
		2	Oct. 30	Nov. 7	8	Nov. 21	22
		3	Oct. 30	Nov. 7	8	Nov. 21	22
12	H–20	1	Oct. 30	Nov. 8	9	———	—
		2	Oct. 30	Nov. 8	9	———	—
		3	Oct. 30	Nov. 8	9	———	—
13	P. B. 40	1	Oct. 31	Nov. 8	8	Nov. 26	26
		2	Oct. 31	Nov. 8	8	Nov. 27	27
		3	Oct. 31	Nov. 8	8	Nov. 27	27
14	P. B. 42	1	Oct. 31	Nov. 10	10	———	—
		2	Oct. 31	Nov. 10	10	———	—
		3	Oct. 31	Nov. 10	10	———	—
15	H–309	1	Oct. 30	Nov. 8	9	Nov. 26	27
		2	Oct. 31	Nov. 9	9	Nov. 27	27
		3	Nov. 4	Nov. 12	8	———	—
16	H–69	1	Oct. 31	Nov. 8	8	———	—
		2	Oct. 31	Nov. 8	8	———	—
		3	Nov. 4	Nov. 12	8	Nov. 27	23
17	Mauritius Malagache	1	Oct. 31	Nov. 8	8	Dec. 1	31
		2	Oct. 31	Nov. 8	8	Dec. 1	31
		3	Oct. 31	Nov. 8	8	Dec. 1	31
18	Negros Purple	1	Oct. 29	Nov. 11	13	Nov. 26	28
		2	Oct. 31	Nov. 12	12	Nov. 28	28
19	Louisiana Striped	1	Nov. 3	Nov. 11	8	Nov. 29	26
		2	Nov. 4	Nov. 12	8	Nov. 30	26
		3	Nov. 5	Nov. 13	8	———	—

21	P. B. 111	1	Nov. 4	Nov. 12	8	——	—
			Nov. 4	Nov. 12	8	——	—
			Nov. 4	Nov. 12	8	——	—
22	P. B. 7A	1	Oct. 31	Nov. 9	9	Nov. 21	21
		2	Nov. 1	Nov. 8	8	Nov. 23	22
		3	Nov. 1	Nov. 8	8	Nov. 23	22
23	P. B. 105	1	Nov. 3	Nov. 12	9	——	—
		2	Nov. 5	Nov. 14	9	——	—
24	P. B. 114	1	Nov. 7	Nov. 11	4	Nov. 26	19
		2	Nov. 7	Nov. 11	4	Nov. 26	19
		3	Nov. 7	Nov. 11	4	Nov. 26	19
25	Demerara 1135	1	Nov. 4	Nov. 9	5	——	—
		2	Nov. 7	——	—	——	—
26	Java 247	1	Nov. 5	Nov. 12	7	Dec. 7	27
		2	Nov. 6	Nov. 13	7	Dec. 8	27
27	Guro or New Guinea 24	1	Nov. 6	Nov. 18	12	——	—
28	Formosa	1	Nov. 7	Nov. 17	10	——	—
		2	Nov. 7	Nov. 17	10	——	—
29	P. B. 75	1	Nov. 7	Nov. 17	10	——	—
		2	Nov. 7	Nov. 17	10	——	—
		3	Nov. 7	Nov. 17	10	——	—
30	P. B. 62	1	Nov. 7	Nov. 14	7	Dec. 7	30
		2	Nov. 7	Nov. 14	7	Dec. 7	30
		3	Nov. 7	Nov. 14	7	Dec. 7	30
31	Mindoro	1	Nov. 9	Nov. 19	10	——	—
		2	Nov. 11	Nov. 21	10	——	—
32	C. A. 12797F_2	1	Nov. 17	Nov. 22	5	——	—
		2	Nov. 17	Nov. 22	5	——	—
		3	Nov. 17	Nov. 22	5	——	—
33	Badila	1	Nov. 24	Dec. 2	8	——	—

TABLE 3

Results of vitality test of pollen grains

COLLEGE NUMBER OR VARIETY NAME	NO. OF POLLEN GRAINS TESTED		NO. OF POLLEN GRAINS GERMINATED		PERCENTAGE OF GERMINATION	
	First test	After 7 hours	First test	After 7 hours	First test	After 7 hours
P. B. 113	97	198	19	4	19.59	2.02
P. B. 112	88	194	18	6	20.45	3.09
P. B. 62	52	109	6	2	11.53	1.83
P. B. 114	105	172	21	5	20.00	2.91
C. A. 12797F_2	100	188	22	6	22.00	3.19

NOTE:—The date pollen was collected was not recorded.

TABLE 4

List of varieties which produced self-fertilized seeds

VARIETIES IN WHICH THE SELF-FERTILIZED SEEDS DID NOT GERMINATE	VARIETIES IN WHICH THE SELF-FERTILIZED SEEDS GERMINATED
P. B. 7	P. B. 68
P. B. 8	P. B. 83
P. B. 91	P. B. 114
P. B. 103	H–309
P. B. 105	H–227
P. B. 2	C. A. 12797F_1
H–69	Mauritius Malagache
H–20	Java 247
C. A. 14806	
C. A. 12681	
Demerara 1135	
Negros Purple	
Louisiana Striped	

TABLE 5.

Comparative vitality and viability of sugar cane seeds

FIRST PLANTING				SECOND PLANTING							THIRD PLANTING						
Percentage of germination			AVERAGE	Number of seeds which germinated			Percentage of germination			AVERAGE	Number of seeds which germinated			Percentage of germination			AVERAGE
T	M	B		T	M	B	T	M	B		T	M	B	T	M	B	
			per cent							*per cent*							*per cent*
2.0	3.1	1.8	2.3	1	4	2	0.1	0.4	0.2	0.23	0	0	0	0	0	0	0
12.2	15.3	7.7	11.73	62	62	38	6.2	6.2	3.8	5.4	11	6	3	1.1	0.6	0.3	0.67
0.5	1.9	1.0	1.13	1	1	0	0.1	0.1	0	0.07	0	0	0	0	0	0	0
0	0	0	0	—	—	—	—	—	—	—	—	—	—	—	—	—	—
0	0	0.1	0.03	Discontinued			—	—	—	—	—	—	—	—	—	—	—
0.8	0.6	0.2	0.53	Discontinued			—	—	—	—	—	—	—	—	—	—	—
0.2	0	0.2	0.13	0	0	0	0	0	0	0	—	—	—	—	—	—	—
0.6	0.1	0.1	0.27	0	0	0	0	0	0	0	—	—	—	—	—	—	—
0.7	0.8	0.3	0.6	0	0	0	0	0	0	0	—	—	—	—	—	—	—
18.3	30.6	30.0	26.3	0	25	3	0	2.5	0.3	0.93	0	0	1	0	0	0.1	0.03
2.9	2.5	1.9	2.43	20	14	9	2.0	1.4	0.9	1.43	0	0	0	0	0	0	0
6.5	3.6	1.9	4.0	39	21	13	3.9	2.1	1.3	2.1	2	2	0	0.2	0.2	0	0.13
0.7	0.4	0.5	0.53	1	2	0	0.1	0.2	0.	0.1	0	0	0	0	0	0	0
0.3	0.2	1.1	0.53	0	0	2	0	0	0.2	0.07	0	0	0	0	0	0	0
0	0	0.6	0.2	2	1	0	0.2	0.1	0	0.1	0	0	0	0	0	0	0
0	0.5	0.1	0.2	0	1	0	0	0.1	0	0.3	0	0	0	0	0	0	0
0.4	1.2	1.2	0.93	10	15	7	1.0	1.5	0.7	1.07	0	0	0	0	0	0	0
22.7	30.9	18.7	24.1	181	185	181	18.1	18.5	18.1	18.23	19	17	11	1.9	1.7	1.1	1.57
0.6	0.3	0.1	0.33	2	0	0	0.2	0.0	0	0.07	2	0	0	0.2	0	0	0.07
0	0.1	0	0.03	Discontinued			—	—	—	—	—	—	—	—	—	—	—
1.4	0.9	0.4	0.9	2	1	0	0.2	0.1	0	0.1	0	0	—	0	0	—	0
0.4	0.4	0	0.27	0	1	0	0	0.1	0	0.03	0	0	0	0	0	0	0
1.6	2.4	0.7	1.5	0	2	4	0	0.2	0.4	0.2	2	1	0	0.2	0.1	0	0.1
0	0.4	0.5	0.3	0	6	1	0	0.6	0.1	0.23	Discontinued			—	—	—	—
23.6	16.1	9.5	16.4	1	1	2	0.1	0.1	0.2	0.13	1	3	0	0.1	0.3	0	0.13
0	0	0.1	0.03	Discontinued			—	—	—	—	—	—	—	—	—	—	—
4.1	4.4	1.7	3.4	0	0	0	0	0	0	0	—	—	—	—	—	—	—
0	0	0	0	—	—	—	—	—	—	—	—	—	—	—	—	—	—
8.4	9.2	7.4	8.3	10	31	20	1.0	3.1	2.0	2.03	Discontinued			—	—	—	—

NO.	COLLEGE NUMBER OR VARIETY NAME	DATE COLLECTED	DATE OF FIRST PLANTING	Number of seeds which germinated		
				T	M	B
		1922	1922			
1	P. B. 113	Oct. 10	Oct. 30	20	31	18
2	P. B. 116	Oct. 23	Oct. 30	122	153	77
3	P. B. 7	Nov. 16	Nov. 20	5	19	10
4	C. A. 14806	———	Nov. 20	0	0	0
5	P. B. 8	Nov. 19	Dec. 1	0	0	1
6	P. B. 103	Nov. 22	Dec. 1	8	6	2
7	H–20	Nov. 23	Dec. 2	2	0	2
8	C. A 12681	Nov. 23	Dec. 2	6	1	1
9	P. B. 91	Nov. 25	Dec. 12	7	8	3
10	P. B. 83	Nov. 25	Dec. 12	183	306	300
11	P. B. 114	Dec. 4	Dec. 13	29	25	19
12	P. B. 111	Dec. 4	Dec. 13	65	36	19
13	H–309	Dec. 2	Dec. 13	7	4	5
14	H–227	Dec. 2	Dec. 13	3	2	11
15	H–69	Dec. 2	Dec. 13	0	0	6
16	Negros Purple	———	Dec. 18	0	5	1
17	Mauritius Malagache	Dec. 13	Dec. 18	4	12	12
18	P. B. 7A	Dec. 9	Dec. 18	227	309	187
19	P. B. 62	Dec. 13	Dec. 18	6	3	1
20	P. B. 105	Dec. 8	Dec. 18	0	1	0
21	P. B. 68	Dec. 14	Dec. 19	14	9	4
22	P. B. 24	Dec. 9	Dec. 19	4	4	0
23	P. B. 19	———	Dec. 19	16	24	7
24	Java 247	Dec. 13	Dec. 19	0	4	5
25	C. A. 13109	Dec. 14	Dec. 19	236	161	95
26	Louisiana Striped	Dec. 23	Dec. 28	0	0	1
27	Hambledon 426	Dec. 23	Dec. 28	41	44	17
28	Formosa	Dec. 23	Dec. 28	0	0	0
29	C. A. 12797F_1	———	Dec. 28	84	92	74

NOTE:—The letter "T" represents the upper third portion of the arrow.
The letter "M" represents the middle third portion of the arrow.
The letter "B" represents the lower third portion of the arrow.

PROFESSOR EVETT D. HESTER: AN APPRECIATION

The greatest problem connected with the building of a University College of Agriculture in the Philippines, has been that of employment overturn. The difficulties of securing competent men for this service, who are at the same time adaptable, good pioneers, and capable of carrying any unexpected overload, has been and is a problem most difficult of solution. In the earlier years when coming to the Philippines was a great novelty, the difficulty was somewhat less though great enough at that time. In later years since the novelty has worn off and it has become recognized that the proposition is one of plain hard work at a low salary, the difficulties of getting and of holding good men has become almost insurmountable.

The recent leaving of Professor Evett D. Hester is a very serious blow to the College. He was one of the few who quickly prove themselves exceptionally well adapted for this type of work and in this particular field. His proficiency in his chosen line of work—Economics and Sociology—was most unusual and his strong, comprehensive grasp of Philippine problems was still more unusual. Add to this a very extraordinary capacity for sustained, intensive work and his value to the College of Agriculture may be fairly estimated.

In addition to building up a strong department, Professor Hester made the Registrar's Office of the College one of the most efficient of its kind known to me. He was also instrumental in developing a strong, active, and successful athletics organization. Likewise, the very admirable beginning that has been made in the building of a real College Library is largely due to his initiative and energy.

Moreover, and highly important in any successful connection with a College staff, Professor Hester was able to maintain friendly working relations with all members of the staff and all members of the staff are equally regretful over his leaving.

It is greatly hoped that after the conclusion of the several years of special work which Professor Hester has planned to do in America, he will be brought back again to the service of the University of the Philippines, where this type of man is so much needed.

CHARLES FULLER BAKER,
Dean, College of Agriculture.

Resolutions presented in bound form to Professor Hester

UNIVERSITY OF THE PHILIPPINES
COLLEGE OF AGRICULTURE
LOS BAÑOS

Whereas, the departure of Professor Evett D. Hester calls to mind his long, continuous, and faithful service to the cause of public education in the Philippines in general, and to the College of Agriculture in particular;

Whereas, it is realized that in the performance of his various duties as member of the faculty of the College of Agriculture, he was always actuated by the highest motives to serve the institution's best interests;

Whereas, his services to this College stand as a model of faithful and disinterested work—worthy of emulation;

And whereas, his departure deprives the College of one of its faithful servants, and its faculty of one of its comrades;

Be it resolved: That we, the undersigned members of the faculty, employees, and students of the College of Agriculture, University of the Philippines, hereby tender to PROFESSOR EVETT D. HESTER our appreciation of his service and admiration of his sterling qualities as an educator, comrade, and friend, and that we jointly and individually wish him *bon voyage* and success in all his future undertakings.

(*The bound copy was signed by the members of the faculty, students, and office and department employees of the College of Agriculture on the Campus during the summer recess.*)

EXCHANGE NOTES

Supplementary advice to the much that is excellent received by our girl graduates might well be, "Go to the farm, young woman, go to the farm!"

The millions of money spent yearly for eggs, meat and vegetables that we import and which we know could be raised locally is a direct challenge to our people's economic pride. But, unfortunately, the "go to the farm" slogan amounts to nothing more than wise commencement day advice.

It seems as if it will have to be the self-imposed task of Filipino housewives to hitch together and safeguard not only the family finances, but also their country's wealth which leaks out annually for things that could be produced in our excellent agricultural country.

The census report states that 28.1 per cent of the women in the Philippines are engaged in farming, either doing actual work on the fields, or managing their own *haciendas*. Statistics also show that these women are successful in their chosen line of work in spite of their lack of training and education.

So we venture to suggest, why not farming for our women?

Admission to the College of Agriculture, we understand, is not discriminatory against the weaker sex. And while all women cannot perform manual labor in the fields, the majority of them will be greatly benefited by a course in farm management or scientific farming on a large scale.

—*The Woman's Outlook*, (Philippine Islands).

There is no blossoming bush more dependent on fresh soil than the rose, and only the most vigorous will thrive for years in the same soil without the addition of fresh mould. Putting in new bushes where old ones have died out without renewing the soil is to court failure.

Where the Queen of Flowers has to remain in the same position for years the best plan is to lift the bushes every four or five years, and to renew the bed with fresh turfy loam in which some well rotted manure is incorporated. After replanting, the bushes during the following spring should be cut back quite closely, deferring the pruning perhaps for a week or two later than usual, according to the weather.

—*The Journal of the Madras Agricultural Students' Union.*
(Reprint from *Scottish Farmer.*)

Covering a period of over a quarter of a century numerous tests and continual observation have well established the fact that minerals are of great importance in the metabolism of the dairy cow. The chemical action of the mineral salts assist in the digestion and assimilation of the proteins, carbohydrates, fats, and crude fibres.

A cow producing only an average amount of milk requires no minerals except those in her feed, unless the quality of the feed is very poor. Grains, grasses, hays, beets or beet pulp, and by-products of grain, such as bran, linseed meal, vacuum-dried distillers' grains and peanut meal are usually high in mineral constituents and form a food of a highly digestible character.

Hays cut when quite young, or just before blooming, as a rule contain the greatest amount of minerals. Hays not properly cured lose many of their mineral salts. Forty-five per cent of the mineral salts can be washed out of alfalfa hay by heavy rains and 25 per cent can be washed out of clover hay.

The variety of the beet has much to do with the percentage of minerals which it contains, is the opinion of Oscar Erf, Professor of Dairying, Ohio State University. The little red beet is higher in ash than the larger beets, and is better for milk production than the sugar beet. Carrots fed in limited quantities are of benefit in supplying minerals.

As a rule concentrates are low in minerals, and, owing to this, high producing cows are not able to obtain a sufficient amount of minerals from their feed without overbalancing the other constituents. The higher the production the greater the amount of mineral salts that must be added to the ration.

Care must be taken in determining the proper minerals, the amount to be fed to each cow and the method of feeding. Minerals should not be fed in a concentrated form, but should be sprinkled over moist hays, silage or grain feeds. Mr. Monroe has found that a small quantity of lime sprinkled over the silage forms calcium lactate, which is desirable for milk production. Even the salt, to be of the greatest benefit, should be mixed with the feed.

The following minerals have been used to the greatest extent and with the best results: Calcium phosphate, calcium carbonate, magnesium sulphate, sodium, sodium phosphate, iodine of potassium, sulphur praecipitatum, black sulphide of antimony, arsenates, iron sulphates, bromides, and sodium chloride. Bone meal and hard wood ashes have been found to give the best results of any minerals, with the exception, of course, of salt. As the production increases it is often advisable to reinforce these with sulphur, potassium iodide, and other minerals. The effect of minerals in the dairy ration is not directly evident in the increased flow of milk. The improvement in the physical condition of the animal is more apparent and due to this the milk flow is eventually increased.

—*The Journal of Agriculture*, (Victoria, Australia).
(Reprinted from *The Dairy*, England.)

COLLEGE AND ALUMNI NOTES

President Palma spent April 27 and 28 on the Campus observing the working of the Summer School. He expressed himself as favorably impressed with the work going on.

Dr. Fillipo Silvestri of the R. Scuola di Agricoltura, at Portici, Italy, and a widely known scientist, especially in connection with the introduction and study of parasites, was a recent visitor at the College. He is making a trip through the Orient in the interests of the State of California, seeking parasites and predaceous insects that may assist in controlling certain citrus scale pests occurring in the States. He expressed himself as charmed with the beauty of our surroundings here, and was greatly impressed with the evident potentialities of the place as a center for research in the agricultural sciences. He remained on the grounds for a number of days.

Among recent visitors at the College were Mr. Frederick Lewis, Manager of Diklom Ranch in Bukidnon, the largest cattle ranch in the Islands, and Governor Antonio Rubin of Bukidnon, Mindanao. Both Mr. Lewis and Governor Rubin visited the herds of the Department of Animal Husbandry and were particularly impressed with the excellent health of the Hereford herd maintained by the College. After seeing the well conformed and growthy grades of the Hereford with the Indian and the Native cow, they visualized the tremendous influence this cross can have in the development of Bukidnon cattle. They asked to be advised any time the College had surplus stock to sell.

Prof. E. D. Hester sailed May 5, for the United States via Europe on the *Carl Legien*.

The Kalends of the Williams & Wilkins Company says: "Best sellers, according to the records for January are: Among new titles: *Medical Aspects of Chemical Warfare*—Vender; *Preparation of Scientific and Technical Papers*—Trelease and Yule; *General Systematic Bacteriology*—Buchanan."

Doctor Villegas, assistant professor of animal husbandry and in charge of instruction in cattle management, spent the month of April visiting different cattle ranches in Bukidnon, Mindanao. Doctor Villegas reports great interest in cattle raising in the region, but marketing facilities have not developed sufficiently to take care of the surplus stock ready for the market. This is the most serious problem the ranchers have to meet at present. Doctor Villegas also visited a carabao herd belonging to ex-Governor Fortich. The herd is headed by Indian buffalo bulls and the grades produced are pronounced to be superior work animals.

A faculty golf club, headed by Dr. B. M. Gonzalez as president and Dr. S. A. Francisco as Secretary-Treasurer, has been organized. The club is starting out with a six-hole campus course, on the west side of Molawin creek.

A delightful *lechonada* was given on April 26, with Professor Hester as guest of honor, by the faculty, office employees and students who remained on the Campus during the summer recess. The assembly hall of the "Y" was transformed into a most attractive dining hall. The tables with covers for about two hundred were gay with abundance of vivid hibiscus and bougainvillea. Although it was a "good-by" gathering, Professor Lopez, who succeeds Mr. Hester in Rural Economics and as Registrar, as toastmaster in a most happy manner gave a tone of jolly fellowship to the occasion. The speakers caught the tone, and the responsive laughter of the guests was frequent. Dean Baker, Doctors Vibar, and Espino spoke for the faculty; Mr. Divinagracia for the student body; and Mr. Velmonte, Instructor in Rural Economics, spoke especially for that department and presented to the honor guest a bound copy of *Resolutions*, signed by the faculty, office and staff employees. Each speaker paid tribute to Professor Hester's work in the College and the esteem in which he is held in words that voiced sincerity. It was honest, not conventional praise. Mr. Hester's response showed that he leaves us feeling "there is no place more charming, blest with God's more bounteous gifts," than our College of Agriculture.

During the dinner Mrs. Adriano and Professor Roa added to the pleasure with piano solos and Mrs. Panganiban with a song.

"Auld Lang Syne" sung heartily by all, sent every one home feeling that it's a good old world and that consciousness of work well done and of warm friends are mighty good things to pack in your trunk when you are saying *Adios*.

Mr. Feliciano Reveche, B. Agr. '23 reports from San Jose, Antique, that two large water beetles (*Hydrous picicornis* Chevr., and *Cybister tripunctatus* Oliv.) are commonly eaten by the people and are now common in the market, selling five for one cent. The beetles must have to be thoroughly roasted to make them edible, since when fresh their shells are almost as hard as ivory.

Mr. Salustiano Gonzales, B. Agr. '25 has been recently appointed graduate assistant in the Department of Entomology. Mr. Gonzales was president of the Senior Class. He wrote a very creditable graduating thesis, entitled "The Sweet Potato Weevil, *Cylas formicarius* Fabr.", which will appear shortly in this Journal.